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## CONTENTS.

### PART I, APRIL, 1908.

	Page
The Retirement of Lieutenant-Colonel Alcock, with a list of his papers, etc., on Indian Zoology ...	I
I. The Fauna of Brackish Ponds at Port Canning, Lower Bengal—	
Part VII.—Further observations on the Polyzoa, with the description of a new genus of Entoprocta ...	11
II. Description of a new Dictyonine Sponge from the Indian Ocean ...	21
III. Notes on Freshwater Sponges—	
No. VIII.—Preliminary notice of a collection from Western India, with descriptions of two new species	25
IV. Remarkable cases of variation—	
No. I.— <i>Squilla investigatoris</i> ...	29
V. Description of a new species of lizard of the genus <i>Salea</i> from Assam ...	37
VI. The Fauna of Brackish Ponds at Port Canning, Lower Bengal—	
Part VIII.—Preliminary description of an Oligochæte Worm of uncertain position ...	39
VII. Description of a new Cavernicolous Phasgonurid from Lower Siam ..	43
VIII. Descriptions of new species of marine and freshwater shells in the collection of the Indian Museum ...	45
IX. Notes on Oriental Syrphidæ, Part I ...	49
X. Description of a new variety of <i>Spongilla loricata</i> ...	97
XI. Notes on Oriental Diptera—	
No. V.—Description of a new species of Psychodid of the genus <i>Phlebotomus</i> ...	101
Miscellanea (pp. 105—112):—	
Remarks on <i>Simotes splendidus</i> ...	105
Corrections to No. IV of "Notes on Oriental Diptera" ...	107
A note on the Isopod genus <i>Tachæa</i> ...	107
The habits of the Amphipod, <i>Quadrivisio bengalensis</i> ...	107
New varieties of <i>Nanina berlangeri</i> and <i>Corbicula fluminalis</i> ...	108
Recent additions to the collection of Entozoa in the Indian Museum ...	108

	Page
A sub-fossil Polyzoan from Calcutta	109
Corrections as to the identity of Indian Phylactolæmata	110
Notes on a peculiar form of <i>Englena</i>	111

## PART II, JULY, 1908.

XII.	Gordiens du Musée Indien	113
XIII.	The Fauna of Brackish Ponds at Port Canning, Lower Bengal—	
	Part IX.—A new species of Amphipoda	119
XIV.	Description of a new species of <i>Danio</i> from Lower Burma	125
XV.	Rhynchota Malayana, Part I	127
XVI.	<i>Cimex rotundatus</i> , Signoret	153
XVII.	Notes on Freshwater Sponges—	
	No. IX.—Preliminary notice of a collection from Burma, with the description of a new species of <i>Tubella</i>	157
XVIII.	Fruits Bats of the genus <i>Pteropus</i> inhabiting the Andaman and Nicobar Archipelagos	159
XIX.	A new species of Sun-Bird obtained near Darjiling	167
XX.	Three Indian Phylactolæmata	169
XXI.	On two new species of Eagle-Rays ( <i>Myliobatidæ</i> )	175
XXII.	Description of a new species of the genus <i>Sesarma</i> , Say., from the Andaman Islands	181
XXIII.	Descriptions of new species of land, marine and fresh-water shells from the Andaman Islands	187

## PART III, OCTOBER, 1908.

XXIV.	The Fauna of Brackish Ponds at Port Canning, Lower Bengal—	
	Part X.—Decapod Crustacea, with an account of a small collection from brackish water near Calcutta and in the Dacca District, Eastern Bengal	211
XXV.	The Fauna of Brackish Ponds at Port Canning, Lower Bengal—	
	Part XI.—Two new Mysidæ from brackish water in the Ganges delta	233
XXVI.	On some Oriental Solifugæ, with descriptions of new forms	241
XXVII.	The difference between the Takin ( <i>Budorcas</i> ) from the Mishmi Hills and that from Tibet, with notes on variation displayed by the former	249
XXVIII.	On <i>Caridina nilotica</i> (Roux) and its varieties	255
XXIX.	Description of a new species of <i>Charaxes</i> from the Bhutan Frontier	285

	Page
XXX. First report on the collection of Culicidæ and Corethridæ in the Indian Museum, with descriptions of new genera and species ... ..	287
Miscellanea (pp. 303—307):—	
Measurements of the skeletons of two large Indian elephants in the Indian Museum ... ..	303
The young of <i>Elurus fulgens</i> ... ..	304
Notes on some Batrachia recently added to the collection of the Indian Museum ... ..	304
Breeding habits of <i>Tylotriton verrucosus</i> ... ..	305
The occurrence of <i>Rhinodon typicus</i> at the head of the Bay of Bengal ... ..	306
Note on <i>Ephydatia meyeri</i> (Carter) ... ..	306

## PART IV, DECEMBER, 1908.

XXXI. Report on a collection of aquatic animals made in Tibet by Captain F. H. Stewart, I.M.S., during the year 1907—	
Part I.—Introduction, Coelenterates, Nematomorpha, Rotifers and Gastrotricha, Entomostraca, Arachnids, Fish (Systematic) and Batrachia ... ..	309
XXXII. Notes on Aculeate Hymenoptera in the Indian Museum, Part I ... ..	347
XXXIII. Indian Psychodidæ ... ..	369
XXXIV. Description of a new species of mouse from the Madura District, Madras ... ..	385
XXXV. Some Cleridæ of the Indian Museum ... ..	387
XXXVI. The Fauna of Brackish Ponds at Port Canning, Lower Bengal—	
Part XII.—Description of a new species of Polychæte worm of the genus <i>Spio</i> ... ..	389
XXXVII. Description of a new species of Saw-Fish captured off the Burma Coast by the Trawler "Golden Crown" ... ..	391
XXXVIII. A new Sting-Ray of the genus <i>Trygon</i> from the Bay of Bengal ... ..	393
XXXIX. New Micro-lepidoptera from India and Burma ... ..	395
XL. Notes on some Chrysomelid Beetles in the collection of the Indian Museum ... ..	401
XLI. Six new Cicindelinae from the Oriental Region ... ..	409
XLII. Description of a new Slug from Tibet ... ..	413

## PART V, JANUARY, 1909.

XLIII. Revision of the Oriental Leptidæ ... ..	417
XLIV. Revised and annotated catalogue of Oriental Bombylidæ, with descriptions of new species ... ..	437





## LIST OF PLATES.

	—○—	<i>Follow page</i>
Plate I ( <i>Eurete annandalei</i> )	...	... 24
Plates II and III ( <i>Squilla investigatoris</i> )	...	... 36
Plates IV and V (Eagle-Rays)	...	... 180
Plate VI ( <i>Grandidierella bonnierii</i> )	...	... 124
Plates VII and VIII (Malayan Rhynchota)	...	... 152
Plate IX ( <i>Spongilla loricata</i> var. <i>burmanica</i> )	...	... 100
Plate X (Skulls of Eagle-Rays)	...	... 180
Plate XI ( <i>Sesarma thelxinoë</i> )	...	... 186
Plate XII (Leptidæ and Bombylidæ)	...	... 492
Plate XIII ( <i>Cimex rotundatus</i> and <i>C.<sup>2</sup> lectularius</i> )	...	... 156
Plates XIV to XVII (Andaman Shells)	...	... 210
Plates XVIII and XIX (Crustacea)	...	... 232
Plate XX ( <i>Caridina nilotica</i> )	...	... 284
Plates XXI and XXII (Mysidæ)	...	... 240
Plate XXIII (Floor of nasal chamber of <i>Budorcas taxicolor</i> )	...	... 254
Plate XXIV (Indian Psychodidæ)	...	... 384
Plate XXV (Tibetan Fish)	...	... 346
Plate XXVI (Views of the Rham-Tso)	...	... 346
Plate XXVII ( <i>Trygon microps</i> )	...	... 394



## LIST OF AUTHORS.

- Annandale, N., B.A., D.Sc. The retirement of Lieut.-Col. Alcock, with a list of his papers, etc., on Indian Zoology, p. 1.—The Fauna of Brackish Ponds at Port Canning, Lower Bengal, Part VII, p. 11.—Notes on Freshwater Sponges, No. VIII, p. 25; No. IX, p. 157.—Description of a new species of Lizard of the genus *Salea* from Assam, p. 37.—Notes on Oriental Diptera, No. V, p. 101.—The habits of the Amphipod, *Quadrivisio bengalensis*, p. 107.—Corrections as to the identity of Indian Phylactolæmata, p. 110.—Three Indian Phylactolæmata, p. 169.—Notes on some Batrachia recently added to the collection of the Indian Museum, p. 304.—Breeding habits of *Tylototriton verrucosus*, p. 305.—Note on *Ephydatia meyeri* (Carter), p. 306.—Report on a collection of aquatic animals made in Tibet by Capt. F. H. Stewart, I.M.S., during the year 1907, Part I: Observations on some specimens of *Hydra* from Tibet, with notes on the distribution of the genus in Asia, p. 311, and description of the tadpole of *Rana pleskii*, with notes on allied forms, p. 345.—A new Sting-Ray of the genus *Trygon* from the Bay of Bengal, p. 393.
- Bentham, T. ... A new species of Sun-Bird obtained near Darjiling, p. 167.—The difference between the Takin (*Budorcas*) from the Mishmi Hills and that from Tibet, with notes on variation displayed by the former, p. 249.—Measurements of the skeletons of two large Indian elephants in the Indian Museum, p. 303.—The young of *Elurus fulgens*, p. 304.—Description of a new species of mouse from the Madura District, Madras, p. 385.
- Bingham, C. T., Colonel Notes on Aculeate Hymenoptera in the Indian Museum, Part I, p. 347.
- Brunetti, E. ... Notes on Oriental Syrphidæ, Part I, p. 49.—Indian Psychodidæ, p. 369.—Revision of the Oriental Leptidæ, p. 417.—Revised and annotated catalogue of Oriental Bombylidæ, with descriptions of new species, p. 437.

- Camerano, Prof. L. ... Gordiens du Musée Indien, p. 113.—Report on a collection of aquatic animals made in Tibet by Capt. F. H. Stewart, I.M.S., during the year 1907, Part I: Sur les Gordiens recueillis par le Capitaine F. H. Stewart dans le Tibet, p. 315.
- Chaudhuri, B.L., B.A., B.Sc. Description of a new species of *Danio* from Lower Burma, p. 125.—Description of a new species of Saw-Fish captured off the Burma coast, p. 391.
- Daday, Prof. E. von ... Report on a collection of aquatic animals made in Tibet by Capt. F. H. Stewart, I.M.S., during the year 1907, Part I: Entomostraca et Hydrachnidæ e Tibet, p. 323.
- Distant, W. L. ... Rhynchota Malayana, Part I, p. 127.
- Godwin-Austen, Lieut.-Col. H. H., F.R.S., etc. Description of an *Agriolimax* from Gyantse, Tibet, collected by Capt. F. H. Stewart, I.M.S., with details of its anatomy, p. 413.
- Hirst, A. S. ... On some Oriental Solifugæ, with descriptions of new forms, p. 241.
- Horn, Dr. Walther ... Six new Cicindelinae from the Oriental region, p. 409.
- Kashyop, Shiv Ram, B.Sc. Notes on a peculiar form of *Englena*, p. 111.
- Kirby, W. F. ... Description of a new Cavemicolous Phasgonurid from Lower Siam, p. 43.
- Kirkpatrick, R. ... Description of a new Dictyonine Sponge from the Indian Ocean, p. 21.—Description of a new variety of *Spongilla loricata*, p. 97.
- Linstow, Dr. O. von ... Recent additions to the collection of Entozoa in the Indian Museum, p. 108.
- Lloyd, R.E., M.B., D.Sc., Capt., I.M.S. Remarkable cases of variation, No. I, p. 29.—On two new species of Eagle-Rays (*Myliobatidae*), p. 175.—The occurrence of *Rhinodon typicus* at the head of the Bay of Bengal, p. 306.—Report on a collection of aquatic animals made in Tibet by Capt. F. H. Stewart, I.M.S., during the year 1907, Part I: Report on the fish collected in Tibet, p. 341.
- Man, Dr. J. G. de ... Description of a new species of the genus *Sesarma*, Say., from the Andaman Islands, p. 181.—The Fauna of Brackish Ponds at Port Canning, Lower Bengal, Part X, p. 211.—On *Caridina nilotica* (Roux) and its varieties, p. 255.—Report on a collection of aquatic animals made in Tibet by Capt. F. H. Stewart, I.M.S., during the year 1907, Part I: Note on a free-living Nematode from Rham-Tso Lake, Tibet, p. 314.
- Mason, G. E. ... Fruit Bats of the genus *Pteropus* inhabiting the Andaman and Nicobar Archipelagos, p. 159.

- Meyrick, E., B.A., F.R.S. New Micro-lepidoptera from India and Burma, p. 395.
- Paiva, C. A. ... Notes on some Chrysomelid Beetles in the collection of the Indian Museum, p. 401.
- Patton, W. S., Capt., I.M.S. *Cinex rotundatus*, Signoret, p. 153.
- Preston, H. B., F.Z.S. ... Description of new species of marine and freshwater shells in the collection of the Indian Museum, p. 45.—Description of new species of land, marine and freshwater shells from the Andaman Islands, p. 187.
- Rhé-Philipe, G. W. V. de Description of a new species of *Charaxes* from the Bhutan Frontier, p. 285.
- Schenkling, S. ... Some Cleridæ of the Indian Museum, p. 387.
- Schlesch, Hans ... New varieties of *Nanina berlangeri* and *Corbicula fluminalis*, p. 108.
- Stebbing, T. R. R., Rev., M.A., F.R.S. A note on the Isopod genus *Tachæa*, p. 107. — The Fauna of Brackish Ponds at Port Canning, Lower Bengal, Part IX, p. 119.
- Stephenson, J., Major, I.M.S. The Fauna of Brackish Ponds at Port Canning, Lower Bengal, Part VIII, p. 39.
- Stewart, F. H., Capt., I.M.S. Report on a collection of aquatic animals made in Tibet by Capt. F. H. Stewart, I.M.S., during the year 1907, Part I: Introduction, p. 309, and Rotifers and Gastrotricha from Tibet, p. 316.
- Tattersall, W. M. ... The Fauna of Brackish Ponds at Port Canning, Lower Bengal, Part XI, p. 233.
- Theobald, F. V. ... First report on the collection of Culicidæ and Corethridæ in the Indian Museum, with descriptions of new genera and species, p. 287.
- Wall, F., Major, I.M.S. ... Remarks on *Simotes splendidus*, p. 105.
- Waters, A. W. ... A sub-fossil Polyzoön from Calcutta, p. 109.
- Willey, A., D.Sc., F.R.S. ... The Fauna of Brackish Ponds at Port Canning, Lower Bengal, Part XII, p. 389.



## ERRATA.

- Page 212, line 12. For "in the Dacca District" read "at Jhalakati in the Backergunj District."
- „ 249, line 5 from bottom. For "figs. 2 and 3" read "figs. 2 and 1."
- „ 253, under "Mishmi average" and opposite "Length of horn." For "571" read "509."
- „ 322, line 13 from bottom. For "*P. squammatum*" read "*L. squammatum*."
- „ 322, lines 1 and 13 from bottom, and page 323, line 9 from top. For "Zelenka" read "Zelinka."
- „ 359, line 7, and page 368, line 4. For "Taunghi" read "Tonglu."
- „ 363, line 22. For "*Anthrena burkelli*" read "*Anthrena burkilli*."
- „ 383, lines 12 and 19. For "*marginipunctata*" read "*margininotata*."





# INDEX.

[*V.B.*—An asterisk (\*) preceding a line denotes a new variety or sub-species; a dagger (†) indicates a new species; and a double-dagger (‡), a new genus: in the case of synonyms the page numbers are printed in *Italics*.]

	<i>Page</i>		<i>Page</i>
<b>A</b>		<i>Andrena</i> <i>floridula</i> ...	362
<i>Abirus</i> ...	405	<i>gracillima</i> ...	364
<i>andamansis</i> ...	405	<i>lugubris</i> , var. ...	362
<i>angustatus</i> ...	405	<i>mephistophelica</i> ...	364
† <i>Acmæa</i> <i>semicornea</i> ...	203	<i>moris</i> ...	362
<i>Acocephalinæ</i> ...	145	<i>Anopheles</i> ...	287
<i>Acrotrichus</i> ...	488	<i>aitkenii</i> ...	287
<i>fusicornis</i> ...	488	<i>Anophelinæ</i> ...	287
<i>gibbicornis</i> ...	488	<i>Anthomyia</i> ...	107
† <i>Acrocercops</i> <i>cyclopa</i> ...	398	<i>bisetosa</i> ...	107
<i>sauropis</i> ...	398	<i>illocata</i> ...	107
† <i>thraustica</i> ...	398	<i>lobalis</i> ...	107
<i>Aculeate</i> <i>Hymenoptera</i> ...	347, 368	<i>tonitrui</i> ...	107
<i>Ædeomyia</i> <i>squamipenna</i> ...	302	<i>Anthophora</i> <i>pulcherrima</i> ...	367
<i>Ælurus</i> <i>fulgens</i> ...	304	<i>quadrifasciata</i> ...	367
<i>Ætheomorpha</i> <i>nigropicta</i> ...	402	<i>Anthracinæ</i> ...	437, 438, 488
<i>Ætherea</i> ...	97	<i>Anthrax</i> 437, 438, 447, 451, 454—456,	
<i>Æthopyga</i> ...	167	471, 478, 486, 488—490	
† <i>griseiceps</i> ...	167	<i>absalon</i> ...	452, 455
<i>nepalensis</i> ...	167	<i>afer</i> ...	451
<i>Ætobatis</i> ...	175, 178, 179	<i>afra</i> ...	451, 455
<i>Agenia</i> <i>alaris</i> ...	352	<i>albida</i> ...	447
<i>Agriolimax</i> ...	413	<i>albofulva</i> ...	454, 455
<i>agrestis</i> ...	415	<i>alexon</i> ...	445
<i>campestris</i> ...	413	<i>angustata</i> ...	(?) 454, 472
var. <i>castanea</i> ...	413	<i>antecedens</i> ...	453, 455
<i>hyperborea</i> ...	413	<i>aperta</i> 438, 453, 455, 475, 476	
<i>intermedius</i> ...	413	<i>apicifera</i> ...	(?) 454
<i>montanus</i> ...	413	<i>arabicus</i> ...	486
<i>occidentalis</i> ...	413	<i>argyropyga</i> ...	449, 491
<i>tristis</i> ...	413	<i>aterrima</i> ...	448
<i>hyperborea</i> ...	415	<i>aurantiaca</i> ...	440
<i>lævis</i> ...	415	<i>auriplena</i> ...	445
<i>tibetanus</i> ...	413, 414	<i>basifascia</i> ...	447
<i>Alaba</i> <i>blanfordi</i> ...	197	(?) <i>bimacula</i> ...	454
† <i>warnefordiana</i> ...	197	(?) <i>brunnipennis</i> ...	490
<i>Allodape</i> <i>parvula</i> ...	366	<i>cæruleopennis</i> ...	439
<i>Alona</i> <i>guttata</i> ...	324, 328	<i>carbo</i> ...	450
<i>Amblycara</i> <i>gladiatoria</i> ...	127	<i>carbonaria</i> ...	437, 448
<i>Amictus</i> ...	487	<i>cingulata</i> ...	490
<i>insignis</i> ...	487	<i>clara</i> 452, 453, 455, 473, 474	
<i>nobilis</i> ...	487	† <i>clausa</i> ...	454, 455, 477
<i>Ammophila</i> ( <i>Psammophila</i> ) <i>tydei</i> ...	355	<i>collaris</i> ...	444
<i>Amphipoda</i> ...	107, 119, 310, 311	<i>combinata</i> ...	440, 442
<i>Anastæchus</i> ...	458	<i>confirmata</i> ...	439, 442
<i>longirostris</i> ...	458	(?) <i>confluens</i> ...	490
		<i>congrua</i> 452, 455, (?) 489	
		<i>degenera</i> ...	448

	<i>Page</i>
Anthrax demonstrans	439, 442
devecta ...	441, 442
dia ...	453, 455
distigma ...	... 449
doryca ...	... 441
duvaucelii ...	452, 455
emarginata ...	437, 454
(?) emilimpida ...	... 490
emissa ...	... 448
emittens ...	... 448
erythrostomus ...	... 486
fimbriatus ...	451, 491
flava ...	... 490
flaviventris ...	... 441
fulvula ...	453, 455, 489
(?) gnata ...	... 489
hottentotta ...	... 455
*var. claripennis	452
hyalina ...	... 452
(?) illata ...	... 489
incanus ...	... 486
instituta ...	... 450
insulata ...	... 446
lar ...	... 443
latifascia ...	440, 442
leucopyga ...	453, 455
leucostigma ...	451, 455
(?) leucotelus ...	... 489
limpida ...	453, 455
lucens ...	... 452
lucida ...	453, 455, 474
(?) luctuosa ...	... 490
manifesta	438, 453, 455, 476
maura ...	... 451
(?) noctiluna ...	... 489
(?) notabilis ...	... 490
paniscus ...	452, 455
pelops ...	... 441
pennipes ...	... 443
percious ...	... 486
(?) prædicans ...	... 454
(?) pretendens ...	... 454
proferens ...	... 448
proserpina ...	... 491
purpuraria ...	... 439
(?) purpurata ...	... 490
(?) reducta ...	... 489
referens ...	452, 455
(?) relata ...	... 489
ruficollis ...	... 444
satellitita ...	451, 455
satyrus ...	... 440
semilucida ...	... 447
semiscita ...	... 450
sirius ...	... 451
sphinx ...	... 440
stenurus ...	... 486
(?) subannulus ...	... 490
subarcuatus ...	... 486
(?) succedens ...	... 489
(?) suffusa ...	... 489
tantalus ...	... 438
tenuis ...	... 486

	<i>Page</i>
Anthrax terminalis ...	451, 455
testacea ...	... 486
trimaculata ...	437, 449
tripunctata ...	... 449
troglodyta ...	452, 455
varia ...	... 450
ventrimacula ...	441, 464
‡Anthrena brunneipennis ...	... 362
burkilli ...	... 363
floridula ...	... 362
gracillima ...	... 364
mephistophelica ...	... 364
mollis ...	... 364
moris ...	... 362
nigroænea ...	... 363
sodalis ...	... 364
Antonia ...	... 487
fedtschenkoi ...	... 487
Anuraïdæ ...	... 321
Aphrophora inclyta ...	... 131
maura ...	... 130
Apidæ ...	... 360
Apis lanata ...	... 365
quadrifasciata ...	... 367
Arachnida ...	... 243, 309
Argyramœba	437, 448, 450, 451, 454, 471, 486, 488, 489, 491
albosparsa ...	... 491
(?) Anthrax)acroleuca	490
aterrima	490
appendiculata	449, 471
aterrima	448, 450
bipunctata	437, 448, 450
carbo ...	... 450
†ceylonica	450, 471
(?) congrua ...	... 489
consobrina ...	... 449
contigua ...	... 491
degenera	448, 451
distigma	437, 449
emissa ...	... 448
emittens ...	... 448
etrusca ...	... 486
fallax ...	... 449
†gentilis	449, 450, 470
(?) gnata ...	... 489
(?) illata ...	... 489
instituta ...	... 450
(?) leucotelus ...	... 489
limatululus ...	... 453
lioyi ...	... 473
melania ...	... 448
nivea ...	... 473
†niveisquamis	450, 472
(?) noctiluna ...	... 489
(?) reducta ...	... 489
(?) relata ...	... 489
semiscita ...	... 450
(?) succedens ...	... 489
(?) suffusa ...	... 489
testacea ...	... 486
varia ...	... 450
Ascaris attenuata ...	... 109

	<i>Page</i>
<i>Ascaris</i> (?) <i>mystax</i> ... ..	109
<i>spp.</i> ... ..	109
<i>Astrophanes</i> ... ..	471
<i>Atherix</i> ... ..	417, 418
† <i>calopa</i> ... ..	418—420, 434
<i>calopus</i> ... ..	434
† <i>cincta</i> ... ..	418, 421, 434
<i>ibis</i> ... ..	417
† <i>lanopyga</i> ... ..	418, 420, 434
<i>limbata</i> ... ..	417—419, 434
(?) <i>var.</i> ... ..	434
<i>luctuosus</i> ... ..	430, 436
<i>marginata</i> ... ..	417
† <i>metatarsalis</i> ... ..	418, 422, 434
<i>nigritarsis</i> ... ..	418, 419, 434
table of Oriental species	418
† <i>Atteva sciodoxa</i> ... ..	398
<i>Atya</i> ... ..	255
<i>wyckii</i> ... ..	255, 269
<i>Atyidae</i> ... ..	256
† <i>Atya convexa</i> ... ..	188
† <i>neglecta</i> ... ..	188
† <i>pacei</i> ... ..	188
† <i>vixumbilicata</i> ... ..	188
<i>Aufidellus</i> ... ..	132, 133
<i>Aufidus</i> ... ..	132, 133
<i>alboater</i> ... ..	135
<i>australensis</i> ... ..	133
<i>bipars</i> ... ..	135
<i>terebus</i> ... ..	134
† <i>papuanus</i> ... ..	133
<i>partitus</i> ... ..	135
† <i>spectabilis</i> ... ..	133
<i>trifasciata</i> ... ..	133
<i>Aufiterna</i> ... ..	132, 133
<i>Aulophorus tongkinensis</i> ... ..	174
<i>Azpeytia</i> ... ..	84
† <i>bifascia</i> ... ..	84

## B

<i>Baccha</i> ... ..	50
<i>dispar</i> ... ..	51
<i>mundula</i> ... ..	51
† <i>nigricosta</i> ... ..	50
† <i>robusta</i> ... ..	50
<i>rubella</i> ... ..	51
† <i>tinctipennis</i> ... ..	51
<i>Balocha</i> ... ..	136
<i>angulifer</i> ... ..	136
<i>tricolor</i> ... ..	136
<i>Banksiella luteolateralis</i> ... ..	297
† <i>Barbatia cancellata</i> ... ..	205
† <i>Batissa capillata</i> ... ..	207
<i>Batrachia</i> 304, 309, 311, ... ..	345
<i>Bdelloida</i> ... ..	316
<i>Bhandara</i> ... ..	143
† <i>picturata</i> ... ..	143
† <i>sarawakensis</i> ... ..	143
<i>semiclara</i> ... ..	143
<i>Bibio lar</i> ... ..	443
<i>paniscus</i> ... ..	452
<i>satyrus</i> ... ..	440

	<i>Page</i>
<i>Bibio sphinx</i> ... ..	440
<i>troglydya</i> ... ..	452
† <i>Bithynia pygmæa</i> ... ..	45, 46
† <i>Bittium insulsum</i> ... ..	45, 46
<i>Bombyliidae</i> ... ..	437, 492
<i>Bombyliinae</i> ... ..	456
<i>Bombylius</i> 417, 456—458, ... ..	487
<i>albavitta</i> ... ..	487
<i>albosparsus</i> ... ..	457, 480
( <i>Anthrax</i> ?) <i>canus</i> ... ..	491
<i>dimidiatus</i> ... ..	491
<i>limbipennis</i> ... ..	491
<i>maculifer</i> ... ..	491
<i>scutellaris</i> ... ..	491
<i>signifer</i> ... ..	491
<i>tripunctatus</i> ... ..	491
<i>ardens</i> ... ..	458
<i>candidus</i> ... ..	487
<i>crassirostris</i> ... ..	487
† <i>erectus</i> ... ..	457, 480
<i>exiguus</i> ... ..	488
<i>fulvipes</i> ... ..	457, 478
<i>hypoleucus</i> ... ..	491
<i>latifrons</i> ... ..	491
<i>maculatus</i> ... ..	456
<i>major</i> ... ..	457, 458
<i>var. australis</i> ... ..	457
<i>megacephalus</i> ... ..	488
<i>miscens</i> ... ..	487
<i>orientalis</i> ... ..	456, 458
<i>penicillatus</i> ... ..	487
<i>pericaustus</i> ... ..	488
<i>pictipennis</i> ... ..	487
<i>pulchellus</i> ... ..	457
<i>sericans</i> ... ..	487
<i>sinuatus</i> ... ..	457
<i>socius</i> ... ..	458
<i>tephroleucus</i> ... ..	487
† <i>terminalis</i> 457, 470, 480 ... ..	456, 458
<i>tricolor</i> ... ..	457
<i>variegatus</i> ... ..	457
† <i>vicinus</i> ... ..	457, 480
<i>wulpii</i> ... ..	457
<i>Bombus</i> ... ..	60, 84
<i>flavescens</i> ... ..	368
<i>haemorrhoidalis</i> ... ..	367
<i>tunicatus</i> ... ..	367
‡ <i>Borduria</i> ... ..	147
<i>impressa</i> ... ..	147
<i>Bothriocephalus</i> ... ..	109
<i>Bowerbankia</i> ... ..	13—15
<i>caudata</i> ... ..	13, 39
<i>Brachypalpus</i> ... ..	86, 87
†(?) <i>dives</i> ... ..	86
<i>Branchinecta orientalis</i> ... ..	309
‡ <i>Brevirhynchus</i> ... ..	287, 293
† <i>magnus</i> ... ..	293
<i>Budorcas</i> ... ..	249, 250, 252, 253
<i>taxicolor</i> ... ..	249—254
( <i>tibetanus</i> ) ... ..	254
<i>whitei</i> ... ..	251
<i>Bufo andersoni</i> ... ..	305
<i>stomaticus</i> ... ..	305

	Page		Page
Bungarus fasciatus ... ..	109	†Caridina opaensis ... ..	230, 231
Bythoscopinæ ... ..	135	propinqua 211, 227, 228, 230,	231, 282, 283
Bythoscopus ... ..	136	sp. ... ..	211, 227
antecedens ... ..	146	syriaca ... ..	227—230
badius ... ..	147	wyckii 256, 257, 262, 265,	269, 269
basivitta ... ..	147	var. gracilipes 256, 257, 270	
bimarginatus ... ..	146	var. paucipara 256, 262, 263	
bistriga ... ..	146	†Cathypna amban ... ..	320
colligatus ... ..	147	luna ... ..	321
concolor ... ..	146	Cavernicolous Phasgonurid ... ..	43
cupreipennis ... ..	147	Cephaloptera stelligera ... ..	176
diaphanus ... ..	147	Cerace ... ..	395
dimidiatus ... ..	147	†mesoclasta ... ..	395
flavibasis ... ..	147	stipatana ... ..	395
impressus ... ..	147	Ceracidae ... ..	395
ineffectus ... ..	145	Ceratina ... ..	366
lætisigna ... ..	146	†bhawani ... ..	366
lanio ... ..	136	hieroglyphica ... ..	365
luteatus ... ..	147	Ceratobatis ... ..	176
metallicus ... ..	145	Ceratocombidae ... ..	154
nigrilinea ... ..	146	Ceratophyia indicus ... ..	94
polygrammus ... ..	146	Ceratoptera ... ..	175, 176, 179
punctatus ... ..	136	ehrenbergii ... ..	176
scabrifrons ... ..	147	†orissa ... ..	176, 177
semivenosus ... ..	147	vampyrus ... ..	176
unicolor ... ..	136	Ceratopterina ... ..	175
<b>C</b>		Cerceris hilaris ... ..	358
Callimerus ... ..	387	pictiventris ... ..	357
†cribratus ... ..	387	var. ferorus ... ..	357
†pulcher ... ..	387	tetradonta ... ..	358
sp. ... ..	388	vigilans ... ..	388
Callophis ... ..	106	Cercopidae ... ..	129
Callostoma ... ..	486	Cercopis ferruginea ... ..	132
desertorum ... ..	486	subdolens ... ..	131
soror ... ..	486	transversa ... ..	132
Camacho bathyploous ... ..	119	Ceria ... ..	94
Campsomeris ceylonica ... ..	352	†apicata ... ..	95
Caridina fossarum ... ..	227, 230	†compacta ... ..	95
gracillima ... ..	227	eumenoides ... ..	96
gracilirostris ... ..	227	javana ... ..	96
hova ... ..	230	metallina ... ..	94
lævis ... ..	229, 230, 282, 283	†obscura ... ..	94
longirostris 255—257, 264, 269		trinotata ... ..	94
nilotica ... ..	211, 255—283	vittigera ... ..	96
*var. bengalensis 211, 257,		Ceriodaphnia pulchella ... ..	324, 329
259, 263, 265, 270		Cestodes ... ..	108
*var. brachydactyla 257,		Charaxes ... ..	285
259, 262—264, 269, 277		echo ... ..	285
var. gracilipes 257, 258,		fabius ... ..	285
261, 264, 266, 268—271,		†raidhaka ... ..	285
280, 281		Chevreuxius ... ..	120
var. longirostris 256, 257,		grandimanus ... ..	119
259, 261, 264, 265,		†Chlamys andamanicus ... ..	204
268—271, 277		Chordodes ... ..	113, 114
var. minahassa 257, 259,		†annandalei ... ..	113
265, 269, 271, 281		†giglio-tosi ... ..	114
*var. natalensis 257, 258,		liguliformes ... ..	114
262, 263, 270, 275		liguligerus ... ..	114
var. paucipara 256—258,		moluccanus ... ..	114
261, 263, 275		siamensis ... ..	113
var. wyckii 257, 259, 265,		weberi ... ..	114
269, 271			

	Page
Chrysididae ...	347
Chrysis angustata ...	348
bengalensis ...	349
cupreiventris ...	348
cyanurum ...	349
fuscipennis ...	348
indica ...	349
lusca ...	349
mendiculis ...	347
nitidula ...	348
obliterata ...	348
oculata ...	349
orientalis ...	349
sarakhsensis ...	348
triacantha ...	348
Chrysoconops ...	287
brevicellulus ...	300
pygmaeus ...	300
Chrysomelidae ...	401—408
Chrysopila guttipennis ...	435
lanopyga ...	420, 434
lupina ...	425, 436
maculipennis ...	435
Chrysopilus 417, 423—426, 435, 436	
albopictus 426, 428, 429, 433—435	
aureus ...	431
correcta ...	435
correctus ...	427, 433, 435
decisus ...	424, 428, 435
ferruginosa ...	425, 428, 432, 433
ferruginosus ...	425, 427, 436
frater ...	428, 431, 433, 436
guttipennis ...	426, 429, 435
impar ...	424, 427, 435
insularis ...	428, 433, 435
fluctuosus 426, 430, 433, 436	
lupinus ...	427, 436
maculipennis ...	426, 435
marmoratus 426, 429, 433, 434, 436	
sauteri ...	427, 431, 435
segmentatus 427, 430, 431, 433	
... 434, 436	
simplex ...	427, 433—435
stigma ...	428, 432, 436
stylata ...	435
stylatus ...	427, 435
table of Oriental species ...	426
unicolor ...	428, 432, 433, 436
vacillans ...	427, 435
Chrysotoxum ...	89
citronellum ...	90
sexfasciatum ...	89, 91
Chunra ...	136
gigantea ...	136
puncticosta ...	136
Chydorus sphaericus ...	324, 327
Cicindela alleni ...	409
catena ...	410
crassipalpis ...	410
feyroyi ...	409
limosa ...	409, 410
nivicincta ...	409, 410
tetragrammicæ ...	410

	Page
Cicindela vittigera ...	409
westermanni ...	410, 411
Cicindelinae ...	409—412
Cimex ...	154
ciliatus ...	153, 155
columbarius ...	154, 155
lectularius ...	153—155
macrocephalus ...	153, 154
pipistrelli ...	154, 155
rotundatus ...	153—155
Cimicidae ...	154
Cittotænia bursaria ...	108
Cladiscus sanguinicolis ...	387
sp. ...	387
Cladocera ...	327, 340, 341
*Clathurella malleti var. nivea ...	192
†selli ...	193
Cleridae ...	387, 388
Clythra suturalis ...	402
Clytra insularis ...	403
lefevrei ...	403
var. ...	403
occipitalis ...	403
orientalis ...	403
succincta ...	403
Cocadumus ...	154
Codionus ...	488
chlorizans ...	488
Cœlenterates ...	309
Cœlidia ...	148
albipes ...	150
albisigna ...	148
aurulenta ...	151
brevis ...	150
canifascia ...	149
cupraria ...	148
dirigens ...	149
diversa ...	149
dorsimacula ...	150
dubia ...	150
guttata ...	150
guttivena ...	149
guttulosus ...	150
inscripta ...	149
leucomelana ...	150
luteifascia ...	149
maculiceps ...	150
marginifrons ...	148
pardalis ...	148
picea ...	149
punctivena ...	149
roseifascia ...	150
rufivena ...	149
selecta ...	150
sexguttata ...	150
var. terminalis ...	150
subapicalis ...	150
subnotata ...	149
testacea ...	150
unifasciata ...	149
verticalis ...	149
Colasposoma affine ...	405
cæruleatum ...	405

	Page
Colasposoma nitida ...	405
ornatum ...	405
Colsa ...	134
costæstriga ...	134
†matanga ...	134
Coluber radiatus ...	109
†Columbella suavis ...	195
Comastes ...	457
pulchellus ...	457
Comptosia ...	456, 486
aurifrons ...	486
bicolor ...	486
brunnipennis ...	456
Considia ...	132
cavata ...	132
nitidula ...	132
oblonga ...	132
transversa ...	132
†Conus edwardi ...	190
zonatus ...	190
Copepoda ...	310, 324, 341
Copeus labiatus ...	318
Coptocephala dubia ...	406
Corbicula fluminalis ...	108
*var. holstiana ...	108
irawadica ...	48
†sylhetica ...	47
syriaca ...	108
Corethra asiatica ...	302
Corethridæ ...	287—302
Corophiidæ ...	119
Corynodes andamanensis ...	405
"andamansis" ...	405, 406
bengalensis ...	408
Cosmoscarta borealis ...	132
†Crabro annandali ...	358
melanotarsis ...	359
*Crassatella radiata var. obsoleta ...	205
Crioceris quadripustulata ...	401
Criorhina ...	87
†(?) dentata ...	87, 88
Criorhinæ ...	88
Crustacea ...	107
Crypsithyris ...	399
†spelæa ...	399
Cryptocephalus analis ...	404
colon ...	404
interjectus ...	406
var. A ...	407
B ...	407
Culex ...	287, 295
fatigans ...	298
fuscocephala ...	299
gelidus ...	298
microannulatus ...	287, 297
mimeticus ...	297
†minor ...	298
sitiens ...	287, 298
tigripes ...	298
vishnui ...	287, 297
Culicidæ ...	287—302
Cyclopidæ ...	341
Cyclops ...	340

	Page
Cyclops serrulatus ...	324, 325
strenuus ...	324, 325
var. lacustris ...	325
viridis ...	324, 325
Cyllenia ...	487
(Anthrax ?) aberrans ...	490
afra ...	490
globiceps ...	487
Cyprinoids ...	107
Cyprinotus congener ...	332

## D

Dabrescus ...	145
costalis ...	146
ineffectus ...	145
lætisigna ...	146
metallicus ...	145
nigrilinea ...	146
remotus ...	145
Daha ...	131
arietaria ...	131
†kuchingensis ...	131
Danio ...	125
albolineatus ...	126
†annandalei ...	125
dangila ...	126
spinosus ...	126
Daphnia longispina ...	324, 330
var. caudata ...	330
Dasyrocroclerus, sp. ...	388
Decapod Crustacea ...	211, 255
Deineches ...	83
†simioides ...	83, 84
Dendrophis pictus ...	109
Desvoidea ...	287
fusca ...	293
obturbans ...	293
var. fusca ...	293
Diamysis ...	234
Diapromorpha dejeani ...	403
melanopus ...	404
pallens ...	404
turca ...	403
var. D ...	404
Diaptomus paulseni ...	324, 327
†tibetanus ...	324—326
Diaschiza exigua ...	319
semiaperta ...	319
taurocephalus ...	319
Dicerobatis ...	176, 179
eregoodoo ...	179, 180
†thurstoni ...	179
Didea ...	54, 56
‡Dideoides ...	54
†ovata ...	54, 55
Diestrammena annandalei ...	43
unicolor ...	43
Diglena catellina ...	318
‡Dinda ...	130
maura ...	130
Dinocharidæ ...	319
Dinocharis pocillum ...	319

	Page
Dinomachus ...	128
†fusus ...	128
marshalli ...	128
†Diplodonta insulsa ...	207
Diploptera ...	359
Dischistus ...	458
†resplendens ...	458, 481
†Doda ...	144
†laudata ...	145
Donax incarnatus ...	208
†nuxfagus ...	207
†tiesenhauseni ...	208
†trigonalis ...	208
Dorylaimus ...	314, 315
stagnalis ...	314, 315
Drillia digitalis ...	191
exasperata ...	192
†fraga ...	191
†sikesi ...	191
Dryopoides ...	119
Dunhevedia crassa ...	324, 327
Dysalotus alcockii ...	109

## E

Ectoprocta ...	11, 19
Elachistidae ...	396
Elasmognathus ...	127
helferi ...	127
†hewetti ...	127
Elephas indicus ...	393
Elis ceylonica ...	352
prismatica ...	352
Ellampus timidus ...	347
Entomostraca ...	399, 323, 341
Entoprocta ...	11, 14, 15, 19
Entozoa ...	168
Eoscarta ...	131
antica ...	132
borealis ...	131, 132
eos ...	131, 132
ferruginea ...	132
rufa ...	132
subdolens ...	131
Ephydatia fluviatilis ...	306, 307
indica ...	25, 26, 157
meyeni ...	306, 307
mülleri ...	306, 307
Eriozona ...	56
analisis ...	57
†ruficauda ...	56
Eristalis ...	54, 68, 70, 71
cognatus ...	71
dimidiata ...	66
(Eristalomyia) sapphirina ...	70
himalayensis ...	70
intricarius ...	70, 73
orientalis ...	70
saxorum ...	66
semicirculus ...	70
sepulchralis ...	66
solitus ...	71

	Page
Eristalis tenax ...	71-73
var. campestris ...	71
tortuosus ...	70
ursinus ...	70
Estheria davidi ...	309
Eucharimya dives ...	457
Euchlanidae ...	320
Euchlanis dilatata ...	320
Euclovina ...	129
†convexa ...	130
okadæ ...	129
†Eucypris minuta ...	310, 324, 332
†tibetana ...	324, 330, 331
Euglena ...	111
tuba ...	111, 112
Eulais megalostoma ...	340
†tibetana ...	324, 339
†Eulima balteata ...	199
Eumenidae ...	359
Eumerus ...	76, 77
argentipes ...	76
argyropus ...	76, 77
†nepalensis ...	76
Eurete ...	21, 23, 24
†annandalei ...	21, 24
erectum ...	24
var. tubuliferum ...	24
Euretidæ ...	21, 24
†Euryalona annandalei ...	324, 328
Euryaulax ...	131
†Eusimonia celeripes ...	241, 247
turkeстана ...	247
Exoprosopa 437, 438, 443, 447, 454, 455,	466, 485, 489
albicincta ...	440
albida ...	447, 466
alexon ...	445, 447, 466
†annandalei ...	445, 469
antica ...	485
audouini ...	441, 464
auriplena ...	445, 447, 466
bagdadensis ...	485
basifascia ...	447, 466
bengalensis ...	445
binotata ...	437, 444, 445
"bipunctata" ...	445
brahma ...	446, 448
cæruleopennis ...	437
chrysolampis ...	439
collaris ...	437, 444, 447
dedecor ...	485
disrupta ...	485
doryca ...	441
†flammea ...	444, 447, 465, 466
†flavipennis ...	444, 447, 465, 466
(?) fumipennis ...	489
fuscipennis ...	439
(?) ignifera ...	489
(?) insularis ...	489
insulata ...	444, 446, 447
javana ...	445
lar ...	443, 444, 447

	Page
† <i>Exoprosopa lateralis</i>	445, 448, 467
† <i>latipennis</i>	444, 447, 464
<i>leuconce</i>	... 441
<i>lugubris</i>	... 485
(?) <i>meigenii</i>	... 489
<i>melæna</i>	... 485
<i>nubeculosa</i>	... 485
<i>obliqua</i>	... 442
<i>ohtonotata</i>	... 446
<i>olivierii</i>	... 485
<i>paupera</i>	... 485
<i>pennipes</i>	443, 444, 447
† <i>retrorsa</i>	445, 468
<i>satyrus</i>	... 440
<i>semilucida</i>	447, 466
<i>singularis</i>	... 485
<i>stupida</i>	... 489
<i>tantalus</i>	... 439
<i>tricolor</i>	... 455
<i>tristis</i>	... 439
(?) <i>umbra</i>	... 489
(?) <i>undans</i>	... 489
<i>vitrea</i>	... 447
(?) <i>vitrecosta</i>	... 489

## F

<i>Farrea</i>	... 24
<i>occa</i> var. <i>foliascens</i>	... 24
<i>laminaris</i>	... 24
<i>Felis pardus</i>	... 108, 109
<i>tigris</i>	... 108
<i>Fenithicola funestus</i>	... 388
<i>Fish</i>	306, 309, 311, 341
<i>Fossores</i>	... 349
<i>Fulgoridæ</i>	... 129

## G

<i>Galeodes</i>	... 246
<i>afghanus</i>	... 246
<i>agilis</i>	241, 242, 246
† <i>annandalei</i>	... 245
<i>araneoides</i>	243, 247
† <i>aulicus</i>	241, 246
<i>auronitens</i>	... 243
<i>bacillifer</i>	245—247
<i>caspicus</i>	... 243
† <i>chitralensis</i>	243, 247
*sub-sp.	
<i>pallescens</i>	244
<i>citrinus</i>	... 242, 243, 246
var. <i>nigripalpis</i>	243
<i>darius</i>	... 241
<i>fatalis</i>	... 243
† <i>festivus</i>	242, 246
† <i>fischeri</i>	241, 244, 246
<i>indicus</i>	243—245, 247
<i>obscurior</i>	... 244
<i>macmahoni</i>	241, 246
<i>nigripalpis</i>	... 243
<i>orientalis</i>	... 246
<i>pococki</i>	... 243

## Page

<i>Galeodes schach</i>	... 242
<i>truculentus</i>	... 242
<i>Gammaridea</i>	... 119
<i>Gastrotricha</i>	309, 316, 322, 323
<i>Gelechiadæ</i>	... 390
<i>Geron</i>	... 417, 459
† <i>argentifrons</i>	... 459, 482
<i>australis</i>	... 459, 483
<i>simplex</i>	... 459
† <i>Gibbula ahena</i>	... 201
† <i>cœni</i>	... 201
<i>phædra</i>	... 201
<i>Gordiidae</i>	... 113, 315, 316
<i>Gordius</i>	... 115, 117
<i>aëneus</i>	... 117
<i>doriæ</i>	... 115
<i>fulgur</i>	... 115
<i>paronæ</i>	... 116
† <i>zavattarii</i>	... 117
† <i>Gorytes icariiiformis</i>	... 356
† <i>Gottonia andamanica</i>	... 45, 46
<i>Gracilariadæ</i>	... 398
<i>Grandidierella</i>	... 120
† <i>bonnieri</i>	... 120
<i>mahafalensis</i>	119—122
<i>Graptomyza</i>	... 63
<i>duodecimnotata</i>	... 63
<i>longirostris</i>	... 63
*var. <i>duo-</i>	
<i>decimnotata</i>	63
† <i>sexnotata</i>	... 63
<i>ventralis</i>	... 63
<i>Gynandrophthalma crassipes</i>	... 402
<i>pallida</i>	... 404
<i>Gyponinæ</i> (?)	... 144, 145
† <i>Gyrineum wilmeriana</i>	... 195

## H

† <i>Habropoda krishna</i>	... 366
<i>magretti</i>	... 366
<i>radoszkowskii</i>	... 367
<i>Halictus albescens</i>	... 360
<i>buddha</i>	... 361
<i>calceatus</i>	... 362
<i>constrictus</i>	... 360
† <i>deiphobus</i>	... 361
<i>lucidipennis</i>	... 361
† <i>paris</i>	... 361
† <i>polycctor</i>	... 360
<i>senescens</i>	... 361
<i>subopacus</i>	... 360
<i>vishnui</i>	... 361
† <i>Haminea callosa</i>	... 189
<i>Hecalus</i>	... 145
<i>paryus</i>	... 145
<i>paykulli</i>	... 145
<i>Hedychridium wroughtoni</i>	... 347
<i>Helice dentipes</i>	... 219
<i>Heliomyia</i>	425, 435 (?)
<i>ferruginea</i>	425, 436



	Page
Helophilus ...	64, 65, 67
taënus ...	65, 66, 68
albiceps ...	... 65, 69
bengalensis ...	64, 66, 69, 70
caudatus ...	65, 67, 68
celebes ...	... 65, 68
conclusus ...	... 65, 69
consors ...	... 66, 69
curvigaster ...	... 65, 68
doleschalli ...	65, 68, 69
insignis ...	... 65, 68
mesoleucus ...	65, 66, 69
notabilis ...	... 65, 68
pendulus ...	... 68
pilipes ...	... 65, 68
quadrivittatus ...	65, 66, 69
†tuberculatus ...	65, 67, 68
vestitus ...	... 65, 68
Hematosiphon ...	... 154
*Hemicardium hystrix var.	
brevispinosa ...	... 206
Heriades parvula ...	... 366
†Herpetocypris smaragdea ...	324, 336, 337
†stewarti ...	324, 333, 334, 338
Heterogastrinae ...	... 128
Heteroptera ...	127, 154
Heterostylum ...	... 457
Hexactinellida ...	... 21
Hilda ...	... 129
†malayensis ...	... 129
undata ...	... 129
Hislopia lacustris ...	... 98
Holopyga indica ...	... 347
Homoptera ...	... 129
Hulecoeteomyia pseudotæniata ...	291
Hydra ...	310—313
Hydrachnidæ ...	323, 339
Hydra fusca ...	311—313
grisea ...	... 313
oligactis ...	... 313
orientalis ...	312, 313
rhætica ...	(?) 311, 312
rubra ...	... 312
spp. ...	... 313
viridis ...	... 313
Hydrophiidæ ...	... 106
Hyperalonia ...	437, 438, 442, 489, 491
albicincta ...	440, 443
argyrea ...	... 442
aurantiaca ...	440, 443, 460
chrysolampis ...	439, 443
combinata ...	... 440
confirmata ...	... 439
demonstrans ...	... 439
devecta ...	441—443, 462
dives ...	439, 443
doryca ...	441, 443, 462, 463
flaviventris ...	441, 443
fuscipennis ...	439, 443
hyx ...	... 439
(?) imbuta ...	... 480
latifascia ...	... 440

	Page
Hyperalonia obliqua ...	442, 443
œnomaus ...	441—443
pennipes ...	443
(?) pulchra ...	489
purpuraria ...	439
(?) rufescens ...	489
satyrus ...	440, 441, 443, 463
sphinx ...	440, 443
suffusipennis ...	440, 443, 462
tantalus ...	437—439, 442, 443
tristis ...	439, 443

## I

Iassus (?) angulifer ...	136
laticeps ...	136
nitidulus ...	136
niveosparsus ...	136
Icaria ...	356
Idiocerus ...	135
adustus ...	135
laticeps ...	136
nitidulus ...	136
(?) punctatus ...	136
Insects ...	107
Irene ...	14, 15
ceylonensis ...	13
Isopoda ...	107
Issinæ ...	129
Isthmia ...	129
Iswara luteus ...	352
Ixalus annandalei ...	395
cinerascens ...	395

## J

Jassidæ ...	135
Jassinæ ...	145
Jassus ...	148
albipes ...	150
albisigna ...	148
(?) aurulenta ...	151
brevis ...	150
canifascia ...	149
dirigens ...	149
diversus ...	149
(?) dorsimacula ...	150
dubia ...	150
glabra ...	148
guttatus ...	150
guttivena ...	149
inclinans ...	148
inscriptus ...	149
leucomelana ...	150
luteifascia ...	149
maculiceps ...	150
nervosus ...	148
pardalis ...	148
piceus ...	149
punctivena ...	149
roseifascia ...	150
rufivena ...	149
subapicalis ...	150

		Page
<i>Jassus subnotatus</i> ...	...	149
testaceus ...	...	150
verticalis ...	...	149

## K

<i>Kalicephalus willeyi</i> ...	...	109
† <i>Kellia mirabilis</i> ...	...	205
<i>Kolla</i> ...	...	144
insignis ...	...	144
polita ...	...	144

## L

<i>Labidostomis cummingi</i> ...	402, 403
humeralis ...	402
<i>Leander carinatus</i> ...	220
hastatus ...	220
japonicus ...	220
longirostris ...	220
sp. ...	211, 220
styliferus ...	220, 222
tenuipes ..	220—222
<i>Ledra parva</i> ..	145
<i>Leicesteria</i> ...	287
†apicalis ...	291
longipalpis ...	292
<i>Lema mandarensis</i> ...	401
<i>Lepidanthrax</i> ...	471
<i>Lepidoderma squammatum</i> ...	322, 323
<i>Lepidoptera</i> ...	399
<i>Lepralia</i> ...	109
( <i>Escharoides</i> ) <i>occlusa</i> ..	110
<i>Léptidæ</i> ...	417, 436
<i>Leptipalpus</i> ...	417, 425, 435
ferruginosa ...	425
flaveolus ...	425
†fulvidus ...	425
(?) <i>waigiensis</i> ...	425, 435
<i>Leptis</i> ...	423—426, 434
albopicta ...	428, 435
†apicipennis ...	423, 434
decisa ...	424, 428, 435
"dichroma" ...	417
ferruginosa ...	425, 436
impar ...	424, 435
marmorata ...	429, 436
"pallidus" ...	433
punctum (?) ...	431—433, 436
uniguttata ...	424, 434
† <i>Leptothyra solida</i> ...	200
<i>Lepus ruficaudatus</i> ...	108
<i>Leucozona lucorum</i> ...	57
† <i>Limnæa simulans</i> ...	46, 47
stagnalis ...	108
<i>Limnophora</i> ...	107
himalayensis ...	107
tonitruum ...	107
<i>Linguatulidæ</i> ...	109
<i>Lituoline Foraminifer</i> ...	23
<i>Lophopus</i> ...	110, 173
carteri ...	171—174
var. <i>himalayanus</i> ...	110

			<i>Page</i>
Lophopus	crystallinus	...	172
	himalayanus	171, 172,	174
	‡heringi	...	174
	lendenfeldi	110,	172
	var. himalayanus		<b>110</b>
‡Lora	...	...	131
	inclyta	...	131
Loxosoma	...	...	14, 19
‡Loxosomatoides	...	14, 16, 19, 39	
	†colonialis		14—17
†Lucapinella	gaylordæ	...	203
Lycastris	...	...	85
	albipes	...	85, 86
	†flavohirta	...	85
Lygæidæ	...	...	128
Lynceus	guttatus	...	328
Lyroda	formosa	...	355
Lysiosquilla	...	31, 32	

## M

<i>Macellopalpus</i> ...	425, 435
flaveolus ...	425, 435
†fulvidus ...	424, 425, 428, 435, 436
<i>Macropsis</i> ...	233, 236
†orientalis ...	236—239
slabberi ...	233, 236—238
† <i>Macroschisma elegans</i> ...	203
<i>Macrothrix hirsuticornis</i> ...	324, 329
<i>Mammals</i> ...	303
† <i>Mangilia andamanensis</i> ...	192
†exasperata ...	192
†obtusa ...	192
<i>Mansonia</i> ...	301
uniformis ...	300
<i>Mansonioides</i> ...	301
annulifera ...	301
<i>Manta birostris</i> ...	176
"Mantis" ...	113
† <i>Margarita ponsonbyi</i> ...	201
† <i>Mastigocerca auchinleckii</i> ...	318
bicornis ...	319
<i>Matla</i> ..	42
bengalensis ...	42
<i>Megachile albifrons</i> ...	365
lanata ...	365
nana ...	365
umbripennis ...	365
<i>Megalophrys</i> ...	305
montana ...	305
parva ...	305
<i>Megaspis</i> ...	71, 72
chrysopygus ...	72
crassus ...	72
errans ...	71, 72, 74
sculptatus ...	72
table of Oriental species ...	72
†transversus ...	73, 74
zonalis ...	73
† <i>Melania charon</i> ...	106
†expatriata ...	106
†multistriata ...	106

			Page
Melanostoma	...	...	53
	ambiguum	...	53
	dubium	...	53
†Melasina	apracta	...	400
†Menestho	acuminata	...	200
Merodon	...	...	85
Metaplex	dentipes	...	211, 219
	distinctus	...	219
	elegans	...	219
Microdon	...	...	91
	tannandalei	...	91, 94
	apicalis	...	93, 94
	tauricinctus	...	93, 94
	tauruleus	...	92, 94
	flavipes	...	92, 94
	fulvicornis	...	94
	indicus	...	94
	metallicus	...	91, 94
	obscurus	...	91, 94
	truficaudus	...	93, 94
	stilboides	...	94
	sumatranus	...	94
	wulpii	...	93, 94
Micro-lepidoptera	...	395—400	
Milesia	...	...	67, 80
	balteata	...	80
	conspicienda	...	80
	gigas	...	80
	himalayensis	...	80, 82
	lamus	...	82
	semifulva	...	80
	variegata	...	80—82
†Mimomyia	minuta	...	301
Mioscarta	...	...	135
	bipars	...	135
	forcipata	...	135
†Miralda	gemma	...	46, 47
Mitra	cruentata	...	194
	ebenus	...	193
	femilæ	...	193
	warnefordiana	...	193
†Modiola	cymbula	...	204
	gubernaculum	...	204
	zebra	...	204
Moina	rectirostris	...	324, 329
Mollusca	...	...	108
Morphota	formosa	...	355
Mucidus	scataphagoides	...	288
Mulio	...	...	486
	(Anthrax ?) leucoprocta	...	490
	lugubris	...	490
	persicanus	...	486
Mus	albidiventris	...	386
Mus	cervicolor	...	386
	(Leggada) buduga	...	385
	ramnadensis	...	385, 386
Musca	maura	...	451
Mutilla	indefrussa	...	350
	tingida	...	351
	interrupta	...	350
	lathonia	...	350
	(Odontomutilla) herpa	...	352
	pilosella	...	355

				<i>Page</i>
Mutilla	pulchrina	...	...	351
	ruficrus	...	...	350
	sexmaculata	...	...	349
	†spectra	...	...	350
	vicinissima	...	...	350
Mutillidae	...	...	...	349
Myliobatidae	...	175, 178,	179	
Myliobatina	...	...	175, 178	
Myosoma	...	...	14, 19	
Mysidae	...	...	233—239	
Mysinae	...	...	233—235	
Mytilus	...	...	204	
Myzomyia	rossii	...	...	287
Myzorhynchus	barbirostris	...	...	288
	vanus	...	...	288

## N

<i>Naididae</i> ...	...	...	42
<i>Nanina berlandieri</i> ...	...	...	108
	*var. <i>globosa</i>	...	108
† <i>Narica depressa</i> ...	...	...	199
† <i>Nassa gerstenbrandti</i>	...	...	194
† <i>jucunda</i> ...	...	...	194
† <i>tristis</i> ...	...	...	194
<i>Natalis spinicornis</i> ...	...	...	388
<i>Necrobia ruficollis</i> ...	...	...	388
	<i>rufipes</i> ...	...	388
<i>Nemachilus stoliczkae</i> ...	...	310, 341	
<i>Nematode</i> ...	...	109, 314	
<i>Nematomorpha</i> ...	...	...	309
<i>Neohydnus despectus</i> ...	...	...	388
	†sp. ...	...	388
<i>Neomacleaya indica</i> ...	...	...	287
	*var. <i>simplex</i>	...	291
<i>Neomysis</i> ...	...	...	234
<i>Neuria</i> ...	...	...	456
	<i>indecora</i> ...	...	456
<i>Nomia clypeata</i> ...	...	...	365
	<i>elliottii</i> ...	...	364
	<i>floralis</i> ...	...	365
	<i>punctata</i> ...	...	364
	<i>punctulata</i> ...	...	364
	<i>westwoodi</i> ...	...	364
<i>Norsia</i> ...	...	...	148
	<i>dilecta</i> ...	...	148
	<i>flavidorsum</i> ...	...	148
	<i>fulvescens</i> ...	...	148
<i>Norsiana</i> ...	...	...	148
	<i>flavidorsum</i> ...	...	148
<i>Notholca scapha</i> ...	...	...	322
	† <i>scaphula</i> ...	...	321
<i>Notommata aurita</i> ...	...	...	317
<i>Notommatadæ</i> ...	...	...	317
<i>Notoscarta</i> ...	...	...	135
	<i>alboater</i> ...	...	135
	<i>croceonigra</i> ...	...	135
	<i>ptyeloides</i> ...	...	135
	† <i>zebrina</i> ...	...	135
† <i>Novaculina andamanensis</i>	...	...	209
<i>Nyssorhynchus fuliginosus</i>	...	...	288

	Page
<b>O</b>	
‡Ochmastis ...	396
†chionacma ...	396
Odostomia aciculina ...	200
pfeifferi ...	46, 47
Odynerus ovalis ...	359
Œciacus ...	154
Oligochæta ...	39, 174, 310, 311
Omadius mediofasciatus ...	388
roepstorfi ...	388
seticornis ...	388
Opetiopalpus obesus ...	388
Ophiuridæ ...	22
Opilo sordidus, var. ...	388
†sp. ...	388
†Oreinus baileyi ...	344
Orthrius andamanensis ...	388
rufotestaceus ...	388
†spp. ...	388
subsimilis ...	388
tarsalis ...	388
Osmia adæ ...	365
Ostracoda ...	310, 330, 341
Otolithus maculatus ...	109

<b>P</b>	
Pachygrapsus lævis ...	217
longipes ...	218
minutus ...	216, 217
planifrons ...	218
†propinquus ...	211, 216, 218
Pagria kanaraensis ...	404
Palæmon altifrons ...	227
amazonicus ...	222, 226
carcinus ...	223—227
var. ...	223
dayanus ...	227
dieperinkii ...	226
dispar ...	227
ensiculus ...	226
jelskii ...	226
lamarrei ...	211, 222, 222, 223, 224
scabriculus ...	227
sp. ...	211, 226
Paludicellidæ ...	13
Parachordodes pustulosus ...	114, 315, 316
Paragordius sp. (?) ...	117
Paragus ...	52
fluteus ...	52
serratus ...	52
Parexostoma maculatum ...	342
stoliczkæ ...	342
Paria cuprescens ...	407
Pectinatella ...	173, 174
†burmanica ...	173, 174
(?) carteri ...	110
davenporti ...	173
gelatinosa ...	173, 174
magnifica ...	173
Pedicellina ...	14, 16, 18, 19
Pelias ...	255

	Page
Pelopæus bilineatus ...	355
Pericoma ...	103, 370
tannandalei ...	370, 380
†appendiculata ...	370, 378—380
†bella ...	370, 383
†margininotata ...	370, 381—384
*var. gilvipes ...	382, 383
*var. lacteitaris ...	382, 383
†sp. ...	370, 378, 380
Phæocyclotomus sp. ...	388
Philanthus pulcherrimus ...	356
punjabensis ...	357
†(Trachypus) nepalensis ...	356, 357
Philodina citrina ...	316
Philodinadæ ...	316
Philodina erythrophthalma ...	316
roseola ...	316
Phlebotomus ...	101, 103, 369
†argenteipes ...	101, 102, 369
Phlogistus imperialis ...	388
Phthiria ...	459
(Anthrax ?) hypoleuca ...	490
gracilis ...	459
Phylactolæmata ...	110, 169—174
Phyllopod ...	309
Phymatidæ ...	154
Phymatophæa pustulifera ...	388
Pipistrella abramus ...	155
Pipizella ...	52, 53
curvinervis ...	53
†indica ...	52
†rufocincta ...	53
sculpeonata ...	53
Pison punctifrons ...	355
Placostola ...	397
Platychirus ...	53
albimanus ...	53
Platypygus ...	487
maculiventris ...	487
Plecia (Bibionidæ) ...	417
Pleurotoma acutigemmata ...	191
†rimata ...	190
Ploas ...	488
adunca ...	488
bombyliiformis ...	488
Ploima Illicata ...	317
Ploima Loricata ...	318
Plumatella ...	110, 170, 174
aplinii ...	170
†bombayensis ...	169—171
coralloides ...	13, 110
emarginata ...	170, 171
fruticosa ...	12, 110, 170
philippinensis ...	170, 171
polymorpha ...	171
princeps ...	110, 171
punctata ...	172
repens ...	110, 171
tanganyikæ ...	169, 170
Plutellidæ ...	395, 398



	<i>Page</i>		<i>Page</i>
Scaphoideus ...	151	Sphyxæ himalayensis ...	82
immistus ...	151	variegata ...	80
†literatus ...	151	Spilogaster ...	107
Scapholeberis mucronata ...	324, 329	Spio ...	389
Scaridium longicaudum ...	319	†bengalensis ...	389
Sceliphron bilineatum ...	355	filicornis ...	389
Scelodonta indica ...	405	Spionidæ ...	389
vittata ...	404	Spogostylum ...	491
†Schizopygopsis stewartii ...	342	distigma ...	449
stoliczkæ ...	311, 342	limatulus ...	453
var. ...	342	Sponge, Dictyonine ...	21
Schizothorax macropogon ...	341, 342	Sponges ...	306
†o'connori ...	343	Spongilla alba ...	13, 107
†Scintilla citrina ...	205	bombayensis ...	25
costata ...	209	carteri ...	13, 25, 157
†elongata ...	206	cinerea ...	25
jukesi ...	206	crassissima ...	13
†perplexa ...	206	Spongillæ ...	25
pretiosa ...	209	†Spongilla indica ...	25
†translucida ...	206	lacustris ...	13, 25
Scolia binotata ...	352	†lapidosa ...	25—27
prismatica ...	352	loricata ...	26, 97—99
quadripustulata var. binotata ...	352	*var. burmanica ...	97, 157
Scoliidæ ...	352	proliferens ...	157
Scotophilus kuhli ...	155	reticulata ...	13
Scylla serrata ...	211	sumatrana ...	25
Selachian ...	393	Spongostylum ...	491
Selinocephalus parva ...	145	flavipes ...	491
Sericomyia ...	89	pallipes ...	491
†himalayensis ...	86	Squilla ...	29—35
Sesarma ...	181	affinis ...	32
amphinome ...	185	armata ...	31
aranaea ...	184	chlorida ...	33
celebensis ...	181	fasciata ...	33
moeschii ...	185	foveata ...	33
ocypoda ...	181, 184	gilesii ...	33
var. gracillima ...	184	gorypetes ...	33
sylvicola ...	181—184	hemischista ...	31, 32
†thelxinoë ...	181, 184, 185	holoschista ...	32
Sialoscarta ...	132	interrupta ...	31, 32
concinna ...	132	investigatoris ...	29—31, 33
Simocephalus elizabethæ ...	324, 329, 330	leptosquilla ...	33, 34
gibbosus ...	329	multicarinata ...	32
mixtus ...	329	ovatoria ...	33
ve. ili ...	330	polita ...	33
ve. loides ...	329	raphidea ...	31, 33
Simotes splendidus ...	105	scorpio (genuina) ...	33
Sitala attegia ...	187	(immaculata) ...	33
cadelli ...	187	stridulans ...	32, 34
†denselirata ...	187	supplex ...	33
†Solaricella dulcissima ...	202	tenuispina ...	32—34
variabilis ...	202	Stathmopoda ...	397
Solenophorus megalcephalus ...	108	†calyptræa ...	397
Solifugæ ...	241	†placida ...	396
Sphaerophoria ...	53	Stegomyia ...	287, 290, 291
distinctus ...	53	†albolateralis ...	289
novæ-guineæ ...	53	amesii ...	289
Sphegidæ ...	355	†assamensis ...	290
Sphinctogonia ...	144	fasciata ...	291
guttivitta ...	144	scutellaris ...	291
quincuncula ...	144	†tripunctata ...	288
lineolata ...	144	Stilbum cyanurum ...	349
Sphyxæ gigas ...	80	†Stomatella crenulata ...	202

	Page
Stomatopoda ...	30
†Strigilla densestriata ...	210
†Styloptygma andamanensis ...	199
Suragina ...	417, 434
illucens ...	417, 434
signipennis ...	417, 434
Sutura fluviatilis ...	203
Syritta ...	76, 77
amboinensis ...	77
illucida (?) ...	77
indica (?) ...	77
laticincta ...	77
orientalis (?) ...	77
pipiens ...	77
Syrphidae ...	49-96
Syrphus ...	54, 56, 57
balteatus ...	57
luniger ...	57
pyrastri ...	57
torvus ...	57
umbellatarum ...	57
Systœchus ...	458, 491
ardens ...	458
eupogonatus ...	458
socius ...	458
Systropus ...	459
(Anthrax ?) funereus ...	491
blumei ...	460, 485
eumenoides ...	459
fœnoides ...	492
funereus ...	492
†nigricaudus ...	460, 483
ophioneus ...	459
polistoides ...	460
saliei ...	492
sphegoides ...	459
tessellatus ...	460, 485
tipuloides ...	460

## T

Tachæa ...	107
lacustris ...	107
spongillicola ...	107
Tachytes modesta ...	355
Tadpole ...	345, 346
Tænia polycalcaria ...	108
Tæniorhynchus ...	288, 293, 294
ager ...	299
tenax ...	299
Takin ...	249-253
†Tapes albomarginata ...	207
Tartessus ...	146, 147
antecedens ...	146
badius ...	147
basivitta ...	147
bistriga ...	146
colligatus ...	147
concolor ...	146
cupreipennis ...	147
diaphanus ...	147
dimidiatus ...	147
ferrugineus ...	146

	Page
Tartessus fieberi ...	146
flavibasis ...	147
polygrammus ...	146
scabrifrons ...	147
semivenosus ...	147
†Tellina cancellata ...	209
†incisa ...	209
†jousseau mei ...	209
†magnifica ...	210
Tenerus andamanensis ...	388
cyanopterus, var. ...	388
flavicollis ...	388
signaticollis ...	388
var. marginipennis ...	388
Terebra albomarginata ...	190
†carnicolor ...	189
fenestrata ...	190
†rubrobrunnea ...	189
†unicolor ...	190
Tetigonia ...	137
Tetigoniidae ...	137
Tettigonia lineolata ...	144
brevis ...	150
(?) dubia ...	150
eburnea ...	137
glabra ...	148
guttivitta ...	144
inclinans ...	148
multipars ...	149
polita ...	144
Tettigoniella ...	137
†annandalei ...	140
†baluensis ...	141
†cumatilis ...	138
eburnea ...	137
elongata ...	142
†erichsoni ...	137
ferruginea ...	138
†thorsfieldi ...	141
†mitrata ...	140
†mouhoti ...	142
nigrilinea ...	143
perakensis ...	141
†ramana ...	138
scitipennis ...	141
†tamborensis ...	139
†timorensis ...	139, 140
trita ...	142
†wallacei ...	143
†wetterensis ...	139
†whiteheadi ...	142
Tettigoniellidae ...	137
Tettigoniellinae ...	137
Tettigoscarta ...	132
nitidula ...	132
Therates gestroi ...	412
*sub-sp. annandalei ...	412
kraatzi ...	412
spinipennis ...	411
var. versicolor ...	411
xanthophilus ...	411
xanthophobus ...	411

	<i>Page</i>
Tillicera bibalteata ...	388
javana ...	388
Tillus notatus var. tristis ...	387
Tineidæ ...	399
Tingididæ ...	127
Tiphia himalayensis ...	352
†Tischeria ptarmica ...	399
†Tornatina conspicua ...	187
Tortricidæ ...	395
Toxophora ...	458
(Anthrax ?) leucopyga ...	491
fulva ...	492
javana ...	458
leucopyga ...	491
zilpa ...	459
Toxorhynchites immisericors ...	288
Trichodes spectabilis var. kuwerti ...	388
Tricophora antica ...	132
cavata ...	132
ferruginea ...	132
rufa ...	132
subpustulata ...	132
Trochospongilla latouchiana ...	157
phillottiana ...	157
Trogodendron fasciculatum ...	388
Tropidonotus piscator ...	109
Trygon ...	393
atrocissimus ...	394
†microps ...	393, 394
Trypeta ...	426
Trypoxylon intrudens ...	355
Tubella ...	157
†vesparioides ...	157
vesparium ...	157
Tubulifera ...	347
Turbellaria ...	310, 311
†Turbonilla foveolata ...	200
Tylototriton verrucosus ...	305
Tympanomerus ...	212
orientalis ...	212—214
pusillus ...	212—215
†stapletoni ...	211, 212, 215

## U

Unciola ...	119, 120
†Unio siliguriensis ...	47
Urnatella ...	14, 15, 19

## V

	<i>Page</i>
Valkeria ...	13
Varuna litterata ...	211, 218
*Vertagus kochi var. polita ...	195
Vespa auraria ...	359
flaviceps ...	359
marginalis ...	359
structor ...	360
Vespertio celeno ...	165
vampyrus ...	165
Vespidæ ...	359
Victorella ...	11, 13—15
†bengalensis ...	11—13
pavida ...	11, 11—13, 39
symbiotica ...	12, 13
Volucella ...	59, 60
†basalis ...	60, 61
decorata ...	60
†discolor ...	60, 62
†lividiventris ...	60, 62
nubeculosa ...	49, 60
opalina ...	60
peleterii ...	60
pellucens ...	61
†ruficauda ...	60—62
trifasciata ...	60
ursina ...	60

## X

Xiphophomyia glossata ...	85
Xylota ...	77
æqualis ...	79
æthusa ...	79
†assamensis ...	79, 80
†auronitens ...	77—79
calopus ...	79
conformis ...	79
cuprina ...	77, 78, 80
cupropicta ...	77, 78
flavitsarsis ...	77, 78
nigroaenescens ...	79
ventralis ...	80

## Y

Ypsolophus ...	396
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## THE RETIREMENT OF LIEUTENANT- COLONEL ALCOCK.

Lieutenant-Colonel A. W. Alcock, C.I.E., M.B., LL.D., F.R.S., came to India as a member of the Indian Medical Service in April 1886, having already had considerable experience of the country, and having also been Assistant Professor of Zoology in the University of Aberdeen under the late Professor H. A. Nicholson, F.R.S. After two years spent on the North-west Frontier as Medical Officer, he was appointed Surgeon Naturalist to the Indian Marine Survey. In 1891 he officiated for some months as Resident Physician and Professor of Pathology at the Calcutta Medical College, and in September 1892 was appointed Deputy Sanitary Commissioner, Metropolitan and Eastern Bengal Circle. In May 1893 he became Superintendent of the Indian Museum and Professor of Zoology at the Medical College; from June 1895 to January 1896 he was on special duty with the Pamir Commission. He retired from the Indian Medical Service and the Superintendship of the Museum on December 29th, 1907. The Trustees of the Museum, at their meeting held on December 6th, passed the following resolution as regards his retirement, and directed that a notice of his connection with the Museum should be published as a mark of their esteem:—

“As Lieutenant-Colonel Alcock’s approaching retirement from Government service has been gazetted since the last meeting of the Trustees, they take the earliest opportunity to express their sense of the value of his work in India to the Museum and to the science of Zoology. It is not within their province to comment upon his scientific researches, which have received the approbation of the scientific world in Europe and America, but they are well aware that it is to Colonel Alcock that the excellent arrangement of the bulk of the research collections in the Museum and of several of the public galleries is entirely due. His wide knowledge, untiring diligence, and scientific acumen are acknowledged by all who have been connected with the Museum. The Trustees are gratified to hear that Colonel Alcock does not intend to sever his connection with the Museum entirely, but proposes to continue in England his invaluable work upon the collection of Crustacea.”

Colonel Alcock’s connection with the Indian Museum may be said to have commenced when he became Surgeon Naturalist on the Indian Marine Survey Ship “Investigator.” Year by year in the monsoon season when the ship was laid up in Bombay harbour, he came to work in Calcutta on the material dredged during the preceding winter, and thus established an association with the late

Mr. J. Wood-Mason, his predecessor as Superintendent, that was fruitful in scientific work. On the death of Mr. Wood-Mason his services were put at the disposal of the Trustees, and he became Superintendent, without, however, leaving the Indian Medical Service.

In the Museum Colonel Alcock made it his aim to work out, so far as it was possible for one man to do, the fauna of the deeper parts of the Indian seas, to set in order the marine collection in the Museum, and to exhibit to the public a judicious selection of the animals identified or described by himself and others. The scientific side of this work, in its more general aspect, is known to all marine zoologists, being embodied in numerous papers and monographs and in his book "*A Naturalist in Indian Seas*," of which there is more to be said. It was mainly on account of his monographs on marine zoology that Colonel Alcock was elected a Fellow of the Royal Society and received the honorary degree of LL.D. from his old University of Aberdeen. The work of arranging and exhibiting the collections of the Museum has naturally a more limited renown. There are few Museums, however, which can boast that their marine collections are in better order and better displayed than is the case in Calcutta. The gradual development which has made it possible to claim for the Indian Museum its place among the great reference collections of the world is almost entirely due to Colonel Alcock's work in this direction.

He did not, however, confine his attention, while connected with the Museum, to marine zoology, as his reports on the zoology of the Pamir Commission and on the reptiles of the Afghan Frontier Commission of 1895 and his biological notes in the publications of the Asiatic Society of Bengal attest, while the many dissections and other preparations he set up in the public galleries of reptiles and other terrestrial vertebrates prove his care for the interests of the students of the Calcutta Medical College, to whom he lectured in disheartening circumstances as regards the absence of all opportunity for practical classes and the humble place as yet given to zoology in the Indian medical curriculum. The bird and mammal galleries are still perhaps the least satisfactory parts of the Museum, but one man could not bring every section to equal perfection, and those who remember their previous state can alone appreciate what was done to improve them in Colonel Alcock's time.

The "*Naturalist in Indian Seas*" (1902) may be regarded as an epitome and a popularization (in the best sense of the word) of the greater part of Colonel Alcock's scientific work in India. It is a book that owes its value not only to its erudition and perspicuity but hardly less to its literary style, in which the strong infusion of Shakespeare and other Elizabethan authors is never pedantic, never frivolous, and never dull. The skill with which such apparently incongruous elements are fused even into the guide books he prepared for the Museum galleries can only be realized by one who has attempted, and failed, to complete a work of the kind he left unfinished.

No account of Colonel Alcock's zoological work in India would be complete without some reference to his connection with the Asiatic Society of Bengal, the scientific collections of which formed the nucleus of the Indian Museum. He became a member of this Society in February 1888, was elected Natural History Secretary in May 1894, General Secretary in April 1895, and Vice-President in February 1901; for several years his papers were by far the most important contributed to the zoological section of the Society's *Journal*.

Colonel Alcock has worked, so far as his service in India is concerned, for his successors rather than himself; but it is fortunately impossible to think that his own work for India is finished. We may confidently hope that it will continue for many years in his retirement to bear the fruit of his unsurpassed accuracy of observation, his many-sided enthusiasm, and his literary talent. As his immediate successor I may be permitted to express my gratitude not only for the zoological knowledge acquired from him and for his unfailing kindness in the Museum and in private life, but also for that sound versatility which prevented the Museum, understaffed as it is now acknowledged to have been, from becoming a lumber-room with one corner set in order by a specialist. The admirable organization of his office, which enabled his successor to take up the threads of routine mechanically, is another matter for which it is impossible to be too grateful: although changes will necessarily take place as the Museum grows and develops, the groundwork will always be that constructed by Colonel Alcock, too often without recognition and in spite of obstacles of which nothing was known beyond the Museum walls.

N. ANNANDALE,

CALCUTTA : *Superintendent, Indian Museum,*  
*January 22nd, 1908. Natural History Section.*



LIST OF PAPERS, ETC., ON INDIAN  
ZOOLOGY PUBLISHED BY  
A. W. ALCOCK, 1890—1907.

I. GENERAL MEMOIRS.

(i) *On Marine Zoology.*

1. Note on the Results of Deep-sea Dredging in 1889-1890.  
(Jointly with J. Wood-Mason.)  
[Ann. Mag. Nat. Hist. (6), vii, 1891, pp. 1-19 and 186-272.]
2. On the Deep-sea Dredging of the season 1890-91.  
(Jointly with J. Wood-Mason.)  
[Ann. Mag. Nat. Hist. (6), viii, 1891, pp. 427-452, pl. xvii.]
3. An Account of the Deep-sea Collection made by the "Investigator" during the season of 1892-93.  
[J. A. S. B., lxii, pt. ii, No. 4, 1893, pp. 169-184, pls. viii-ix.]
4. A Summary of the Deep-sea Zoological Work of the R.I.M.S. "Investigator" from 1884-1897.  
[Scientific Memoirs by Medical Officers of the Army of India, pt. xi, 1899, pp. 1-49.]
5. Zoological Gleanings from the R.I.M.S. "Investigator."  
[Scientific Memoirs by Medical Officers of the Army of India, pt. xii, 1901, pp. 1-42.]
6. A Naturalist in Indian Seas, or four years with the R.I.M.S. "Investigator," London, 1902, pp. i-xxiv and 1-318; 98 figs. and a map.

(ii) *On Bionomic Subjects.*

7. Observations on the Gestation of some Sharks and Rays.  
[J. A. S. B., lix, pt. ii, No. 1, 1890, pp. 51-56, pl. i.]
8. On the uterine villiform Papillæ of *Pteroplatea micrura*, and their Relation to the Embryo.  
(Jointly with J. Wood-Mason.)  
[Proc. Roy. Soc., xlix, 1891, pp. 359-367, pls. 7 and 8.]
9. Further Observations on the Gestation of Indian Rays.  
(Jointly with J. Wood-Mason.)  
[Proc. Roy. Soc., l, 1891, pp. 202-209.]

10. On a Viviparous Bathybial Fish from the Bay of Bengal.  
[Proc. Zool. Soc., 1891, pp. 226-227.]
11. On Utero-gestation in *Trygon bleekeri*.  
[Ann. Mag. Nat. Hist. (6), ix, 1892, pp. 417-427, pl. xix.]
12. Some Observations on the Embryonic History of *Pteroplatea micrura*.  
[Ann. Mag. Nat. Hist. (6), x, 1892, pp. 1-8, pl. iv.]
13. A Case of Commensalism between a Gymnoblasic Anthomedusoid (*Stylactis minoi*) and a Scorpænoid Fish (*Minous inermis*).  
[Ann. Mag. Nat. Hist. (6), x, 1892, pp. 207-214.]
14. On a New Species of Viviparous Fish of the family *Ophidiidae*.  
[Ann. Mag. Nat. Hist. (6), xvi, 1895, pp. 144-146.]
15. An Instance of the Natural Repellent Effect of "Warning Colours."  
[J. A. S. B., lxxv, pt. ii, No. 3, 1896, pp. 539-540.]
16. On the Toxic Properties of the saliva of certain "non-poisonous" Colubrids.  
(Jointly with L. Rogers.)  
[Proc. Roy. Soc., lxx, 1902, pp. 446-454.]
17. On the occurrence of *Anopheles (Myzomyia) listoni*, a malaria-carrying mosquito, in Calcutta.  
(Jointly with J. R. Adie.)  
[Proc. Roy. Soc., lxxvi, 1905, pp. 319-321.]

## II. SYSTEMATIC PAPERS.

### (i) *Anthozoa*.

18. On some Newly-recorded Corals from the Indian Seas.  
[J. A. S. B., lxii, pt. ii, No. 2, 1893, pp. 138-149, pl. v.]
19. On some *Actiniaria* from the Indian Seas.  
[J. A. S. B., lxii, pt. ii, No. 3, 1893, pp. 151-153.]
20. Note on *Calypterinus allmani*.  
[Ann. Mag. Nat. Hist. (6), xii, 1893, pp. 29-30.]
21. On some New and Rare Corals from the Deep Waters of India.  
[J. A. S. B., lxiii, pt. ii, No. 3, 1894, pp. 186-188.]
22. An Account of the Deep-sea *Madreporaria* collected by the R.I.M.S. "Investigator," 29 pp., 3 pls.
23. Report on the Deep-Sea *Madreporaria* of the "Siboga Expedition."  
[Siboga-Expeditie, 1899-1900. Resultats des Explorations Zoologiques, Botaniques, Oceanographiques et Geologiques. Publiés par Max Weber. 4to. Pt. xvi a, 1902, *Madreporaria*.]

24. Diagnoses and Descriptions of New Species of Corals from the "Siboga-Expedition."

[Tijdschr. d. Ned. Dierkund, Vereen. (2), vii, 3, 1902, pp. 89-115; 116-123.]

(ii) *Echinoderma.*

25. An Account of the Collection of Deep-sea *Asteroidea*.

[Ann. Mag. Nat. Hist. (6), xi, 1893, pp. 73-121, pls. iv-vi.]

(iii) *Brachiopoda.*

26. A New Brachiopod.

[J. A. S. B., lxiii, pt. ii, No. 2, 1894, pp. 139-140, pl. viii.]

(iv) *Crustacea.*

27. On the Deep-sea Crustacea collected by the "Investigator" in 1890-91.

[Ann. Mag. Nat. Hist. (6), xiii, 1894, pp. 225-245, 321-334, 400-411.]

28. An Account of a Recent Collection of Deep-sea Crustacea from the Bay of Bengal and Laccadive Sea.

(Jointly with A. R. S. Anderson.)

[J. A. S. B., lxiii, pt. ii, No. 3, 1894, pp. 141-185, pl. ix.]

29. List of the Shore and Shallow-water *Brachyura* collected by the "Investigator" in 1893-94.

(Jointly with A. R. S. Anderson.)

[J. A. S. B., lxiii, pt. ii, No. 4, 1894, pp. 197-209.]

30. Materials for a Carcinological Fauna of India. No. 1. The *Brachyura Oxyrhyncha*.

[J. A. S. B., lxiv, pt. ii, No. 2, 1895, pp. 157-291, pls. iii-v.]

31. Materials for a Carcinological Fauna of India. No. 2: The *Brachyura Oxystoma*.

[J. A. S. B., lxv, pt. ii, No. 2, 1896, pp. 134-296, pls. vi-viii.]

32. Description of a New Species of *Branchipus* from Calcutta.

[J. A. S. B., lxv, pt. ii, No. 3, 1896, pp. 538-539, pl. x.]

33. Materials for a Carcinological Fauna of India. No. 3. The *Brachyura Cyclometopa*. Pt. i. The Family *Xanthidae*.

[J. A. S. B., lxvii, pt. ii, No. 1, 1898, pp. 67-233.]

34. Materials for a Carcinological Fauna of India. No. 4. The *Brachyura Cyclometopa*. Pt. ii. The Families *Portunidae*, *Cancridae* and *Corysidae*.

[J. A. S. B., lxviii, pt. ii, No. 1, 1899, pp. 1-104.]

35. An Account of the Deep-sea *Brachyura* collected by the R.I.M.S. "Investigator," pp. 1-85, 4 pls.

36. Materials for a Carcinological Fauna of India. No. 5. The *Brachyura Primigenia* or *Dromiacea*.

[J. A. S. B., lxviii, pt. ii, No. 3, 1899, pp. 123-169.]

37. An Account of the Deep-sea Crustacea dredged by the "Investigator" in 1897-98.

(Jointly with A. R. S. Anderson.)

[Ann. Mag. Nat. Hist. (7), iii, 1899, pp. 1-27, 278-292.]

38. Materials for a Carcinological Fauna of India. No. 6. The *Brachyura Catometopa*.

[J. A. S. B., lxi, pt. ii, No. 3, 1900, pp. 279-456.]

39. A Descriptive Catalogue of the Deep-Sea *Crustacea*, *Macrura* and *Anomala* in the Indian Museum, 1901, pp. 1-286, pls. i-iii.

40. Catalogue of Decapod Crustacea in the Indian Museum. Pt. i. *Brachyura*. Fascicle i. Introduction and *Dromides* or *Dromiacea* (*Brachyura primigenia*), 1901, pp. i-ix and 1-80, pl. A, i-vii.

41. Catalogue of the Indian Decapod Crustacea in the Indian Museum. Pt. ii. *Anomura*. Fascicle i. *Pagurides*, 1905, pp. i-xi and 1-197, pls. i-xvi.

42. Catalogue of the Indian Decapod Crustacea in the Indian Museum. Pt. iii. *Macrura*. Fascicle i. The Prawns of the *Peneus* group, 1906, pp. i-ii and 1-55, pls. i-vii.

43. Marine Crustaceans, *Paguridæ*.

[Fauna and Geography of the Maldivé and Laccadive Archipelagoes. Stanley Gardener II, pt. iv, pp. 827-835, pl. lxviii.]

44. On a new species of the Dorippoid genus *Cymonomus* from the Andaman Sea, considered with reference to the geographical distribution of the *Dorippidæ*.

[Ann. Mag. Nat. Hist. (7), xv, 1905, pp. 565-576, pl. xviii.]

45. A Revision of the genus *Peneus*.

[Ann. Mag. Nat. Hist. (7), xvi, 1905, pp. 508-532.]

#### (v) *Fishes.*

46. List of the *Pleuronectidæ* obtained in the Bay of Bengal in 1888 and 1889, with Descriptions of New and Rare Species.

[J. A. S. B., lviii, pt. ii, No. 3, 1889, pp. 279-295, pls. xvi-xviii.]

47. Descriptions of some New and Rare Species of Fishes from the Bay of Bengal, obtained during the season of 1888-89.

[J. A. S. B., lviii, pt. ii, No. 3, 1889, pp. 296-305, pl. xxii.]

48. On the Bathybial Fishes of the Bay of Bengal and neighbouring waters, obtained during the seasons 1885-89.

[Ann. Mag. Nat. Hist. (6), iv, 1889, pp. 376-399 and 450-461.]

49. On the Bathybial Fishes collected in the Bay of Bengal during the season 1889-90.

[Ann. Mag. Nat. Hist. (6), vi, 1890, pp. 197-222, pls. viii-ix.]

50. On the Bathybial Fishes of the Arabian Sea, obtained during the season 1889-90.

[Ann. Mag. Nat. Hist. (6), vi, 1890, pp. 295-311.]

51. On some Undescribed Shore-Fishes from the Bay of Bengal.

[Ann. Mag. Nat. Hist. (6), vi, 1890, pp. 425-443.]

52. On the Deep-sea Fishes collected by the "Investigator" in 1890-91.

[Ann. Mag. Nat. Hist. (6), viii, 1891, pp. 16-34, 119-138, pls. vii-viii.]

53. On the Bathybial Fishes collected by the "Investigator" in 1891-92.

[Ann. Mag. Nat. Hist. (6), x, 1892, pp. 345-365, pl. xviii.]

54. An Account of a Recent Collection of Bathybial Fishes from the Bay of Bengal and from the Laccadive Sea.

[J. A. S. B., lxiii, pt. ii, No. 2, 1894, pp. 115-137, pls. vi-vii.]

55. A Supplementary List of Marine Fishes of India, with Descriptions of two new Genera and eight new Species.

[J. A. S. B., lxv, pt. ii, No. 3, 1896, pp. 301-338.]

56. A note on the Deep-sea Fishes, with Descriptions of some new Genera and Species, including another probably Viviparous Ophidioid.

[Ann. Mag. Nat. Hist. (7), ii, 1898, pp. 136-156.]

57. An Account of the Deep-sea Fishes collected by the R.I.M.S. "Investigator"; being a descriptive Catalogue of the Deep-sea Fishes contained in the collection of the Indian Museum.

(vi) *Reptilia and Amphibia.*

58. On a New Species of Flying Lizard from Assam.

[J. A. S. B., lxiv, pt. ii, No. 1, 1895, pp. 14-15, pl. iii.]

59. An Account of the Reptilia collected by Dr. F. P. Maynard, Capt. A. H. McMahon, C.I.E., and the Members of the Afghan-Baluch Boundary Commission of 1896.

(Jointly with F. Finn.)

[J. A. S. B., lxv, pt. ii, No. 4, 1896, pp. 550-566, pls. xi-xv.]

60. Description of, and Reflections upon, a new species of Apodous Amphibian from India.

[Ann. Mag. Nat. Hist. (7), xiv, 1904, pp. 267-272, pl. vii.]



## III. OTHER (OFFICIAL) PUBLICATIONS.

1. Illustrations of the Zoology of the R.I.M.S. "Investigator," 1892—1907.

(Jointly with J. Wood-Mason, A. R. S. Anderson, A. F. McArdle, A. C. MacGilchrist and N. Annandale.)

Fishes . . pls. i-xxxviii.

Crustacea—

Malacostraca . . i-lxxix.

Entomostraca . . i-ii.

Echinoderma . . i-v.

Mollusca . . i-xviii.

2. Report on the Natural History Results of the Pamir Boundary Commission of 1895.

Pages 1-18 ; 32-45 ; 4 pls.

3. A Guide to the Zoological Collections exhibited in the Invertebrate Gallery of the Indian Museum.

Pages 1-155, with 1 plan.

4. A Guide to the Zoological Collections exhibited in the Reptile and Amphibia Gallery of the Indian Museum.

Pages 1-47, with 1 plan.

5. A Guide to the Zoological Collections exhibited in the Fish Gallery of the Indian Museum.



# I.—THE FAUNA OF BRACKISH PONDS AT PORT CANNING, LOWER BENGAL.

## PART VII.—FURTHER OBSERVATIONS ON THE POLYZOA, WITH THE DESCRIPTION OF A NEW GENUS OF ENTOPROCTA.

By N. ANNANDALE, D.Sc., *Superintendent, Indian Museum.*

A considerable change has taken place in the Polyzoa of the ponds this winter, apparently owing to last summer's floods, which broke down the embankment that separated the ponds from the river, joining them together temporarily. It will, therefore, be well to publish the observations arising from a visit to Port Canning in December, 1907, both as regards the species already recorded and as regards a new genus that appears to have been introduced since last winter. A comparison with European specimens, moreover, has also made it necessary to recognize the Bengal *Victorella* as a distinct species

### ECTOPROCTA.

*Victorella bengalensis*, sp. nov.

*V. pavid*a, Kent, Annandale, *Rec. Ind. Mus.*, i, p. 200.

The numerous colonies recently obtained in the ponds are more luxuriant than any I have seen before in India. Thanks to the kindness of Mr. R. Kirkpatrick, of the British Museum, and Mr. C. F. Rousselet, I have been able to compare them with some exceedingly beautiful preparations of the true *Victorella pavid*a made by the latter. In my former account of the form that occurs at Port Canning, I stated that I had found no specimens in which the proliferation was comparable in complexity with that of the colony of which a part is figured by Kraepelin in fig. 75, pl. iii of his *Süsswasser-Bryozoen*. Examples taken in the ponds this winter, however, are quite as complicated. The general appearance of the colonies is that of a thick fur coating the grass stems, etc., on which they grow. When free from green algæ they are of a very pale flesh-colour as a whole, some of the zoecia being tinged with yellow, but the majority being practically colourless. The exact tint of the stomach depends on its contents, but it has intrinsically a

faint yellowish tinge. The complexity of budding is well illustrated by the accompanying figure (fig. 1) of the upper part of a parent zoecium with its buds of the first, second, third and fourth degrees. As a rule buds of the first degree arise direct from the upper part of a large zoecium, but sometimes a short tubular outgrowth intervenes, such outgrowths being more common in the case of buds of younger generations. A common form of what we may take as the unit of the colony (*viz.*, a parent zoecium and its direct offspring produced by budding) is that of an upright stem (the parent zoecium) with a single antler-like branch, consisting of buds and their buds, at one side; but two or more such branches are not infrequently produced.

No trace of resting buds was found in specimens killed on December 24th.

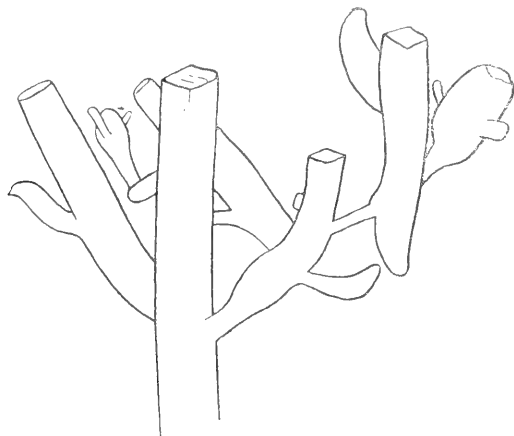


FIG. 1.—*V. bengalensis*, Port Canning, Dec. 1907.

In the following points the Indian species differs from the European examples of *V. pavida* I have examined :—

- (1) in the small size of the swelling from which the zoecia arise ;
- (2) in the fact that a considerable number of zoecia are frequently grouped together with very short intervening false stola ;
- (3) in the more powerful development of the gizzard ;
- (4) in the fact that the distal part of *some* of the adult zoecia is approximately circular in cross-section.

In the first two of these points, and to some extent in the fourth, *V. bengalensis* resembles Rousselet's recently described *V. symbiotica*<sup>1</sup> from Lake Tanganyika ; but we have no details of the anatomy of this African form, which was found growing in the substance of a freshwater sponge very much in the same way as the *coralloides* phase of *Plumatella fruticosa* grows in

<sup>1</sup> *Proc. Zool. Soc.*, 1907 (i), p. 255. The colonies seen by Mr. Rousselet were apparently devoid of lateral buds, but so are many examples of *V. bengalensis*.

*Spongilla lacustris* in Europe and in *S. carteri*, *S. reticulata* and *S. crassissima* in India. The Port Canning form of *Victorella* has not as yet been found in close connection with the sponge (*S. alba*) so common in the same ponds, but owing to the small area of the objects to which the colonies are attached, the zoëcia are crowded together in very much the same way as would be the case if they were included in the substance of a sponge; they stand to one another, to put the matter in a different way, in much the same relation as the zoëcia of *Plumatella coralloides* stand to the tissues of the sponge in which they are inclosed.

All the zoëcia of *V. symbiotica* figured by Rousselet are circular in cross-section throughout; while in *V. bengalensis* some are circular or nearly so, some distinctly square.

The nature of the gizzard, which in the Indian form though thin-walled (as compared with that of *Bowerbankia*) is decidedly muscular, may be a more important feature from a systematic point of view. Saville Kent denied that *V. pavidia* had a gizzard at all, while Bousfield called attention to its existence. That the statement of the former author was due to a misapprehension is very possible, for even Hincks, whose experience of the Polyzoa was very much greater, at first placed the form he afterwards called *Bowerbankia caudata* in the genus *Valkeria*, on the ground that it had no gizzard. In this case, however, Hincks had only somewhat badly preserved specimens on which to base his diagnosis in the first instance, while Kent observed his specimens alive and was accustomed to minute microscopic investigation. I cannot, therefore, see any ground at present for separating the *Victorella* of Lower Bengal generically from that of Europe, although I am forced to regard it as a new species, for it is possible that the nature of the gizzard is a variable character, while the exact form of the connection between the zoëcia is one that actually differs in different parts of the same colony: as a rule it has the quadriradiate formation regarded as so important by Rousselet, whose remarks on this point (*op. cit.*, p. 252) are in full agreement with mine (*Rec. Ind. Mus.*, i, p. 201) on the "false stolon" of the Paludicellidæ.

I have recently found *Victorella* in a pond of fresh water near Calcutta, the specimens agreeing in every respect with those taken this winter at Port Canning.

*Bowerbankia caudata* (Hincks).

I have been able to observe no difference between the specimens taken last year and those taken this. In several of the tanks I found colonies of the species interlaced with colonies of the hydroid *Irene ceylonensis*, which the floods already alluded to have apparently enabled to extend its range in the ponds considerably, as it was previously found in one of them only but is now common in nearly all. It will, I think, be convenient to distinguish the Port Canning form as "race *bengalensis*."

## ENTOPROCTA.

Among dense masses of *Victorella*, *Bowerbankia* and *Irene* on grass stems I noticed, in some preserved material obtained from Port Canning at the beginning of December, 1907, numerous little polypoid organisms, evidently Entoproctous polyzoa. Their condition made it impossible to examine them properly, but on December 24th I was able to collect living specimens. An investigation based on these and on carefully preserved material proved them to represent a new genus, for which I have coined the name *Loxosomatoides*, in order to indicate its resemblance in one important character to *Loxosoma*; in some of its characters, however, it resembles *Pedicellina* more closely, and in others *Urnatella*, while it is perhaps more closely allied to the American *Myosoma* than to any other genus.

*LOXOSOMATOIDES*, gen. nov.

Colonial, deciduous Entoprocta arising from a creeping stolon; the calyx separated from the stalk by a diaphragm, with a slanting or vertical lophophore, and bearing on its aboral surface a chitinous shield, which is absent from the stalk.

*Loxosomatoides colonialis*, sp. nov.

Colony consisting of a large number of polypides, which arise, singly and at considerable intervals, from a sparsely branched, unsegmented stolon. Stalk smooth, minutely and irregularly annulated, variable in length. Calyx with from twelve to sixteen tentacles, which are bluntly pointed and relatively short. The shield borne on the aboral surface covering the whole of one side of the calyx, of an oval shape, covered with a large number of minute subrectangular depressions, which are separated from one another by narrow ridges, giving the whole structure a reticulated appearance; stout spines, very variable in number and size, scattered irregularly on the shield. Alimentary canal more or less asymmetrical, the colon emerging from the stomach at one side; stomach subspherical, very large.

Two distinct forms of the species can be distinguished. It is impossible to separate them specifically, because polypides intermediate between them occur, but the colonies representing them are quite easy to distinguish as colonies, and the differences are probably due to differences in environment.

*Form A.*—Stalk much longer than calyx, clean; calyx of full-grown polypide measuring about 0.414 mm. in vertical length; spines on shield not very strongly developed (figs. 2, 3).

*Form B.*—Stalk not or very little longer than calyx, encrusted with inorganic débris; calyx of full-grown polypide measuring about 0.357 mm. in vertical length; spines on shield strongly developed, black at the tip (fig. 4).

Form A was found growing amidst dense colonies of *Victorella*, *Bowerbankia* and *Irene*, while Form B was by itself on grass stems.

The structure of the new Entoproct does not differ materially from that of other members of the group; its main outlines are

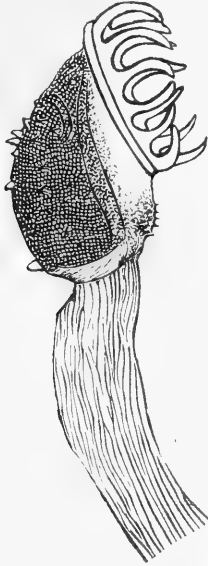


FIG. 2.

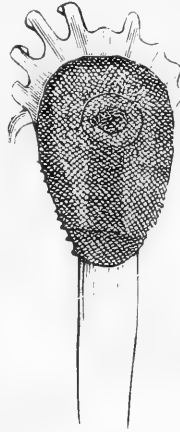


FIG. 3.

FIGS. 2 AND 3.—*L. colonialis*, form A,  $\times 70$  (from preserved specimens).

clearly shown in fig. 5, which is drawn from a camera-lucida sketch of a carefully stained specimen. It will be well, however, to give a brief description of the more important and conspicuous organs.



FIG. 4.—*L. colonialis*, form B,  $\times 70$  (from preserved specimen).

#### *Lophophore*—

The extended lophophore bears a very close resemblance to that of *Urnatella* as figured by Leidy, owing not only to the direction of its main axis but also to the outline of the sphincter muscle, which in the living polypide has, when relaxed, a

peculiarly delicate and at the same time expanded appearance; it extends as a delicate, web-like structure for a considerable distance beyond the circle of tentacles. The tentacles are distinctly webbed at the base, apart from the sphincter, and, like those of *Pedicellina*, terminate somewhat abruptly. The fringe of cilia appears to be continuous round the distal extremity. When the tentacles are folded and the sphincter is contracted, the integument drawn together forms a papilla on the surface, the aperture being extremely minute and having a tubular form. The direction of the lophophore is capable of a certain change. When contracted, it stands parallel to the main axis of the calyx, but when the sphincter is fully relaxed it slants considerably.

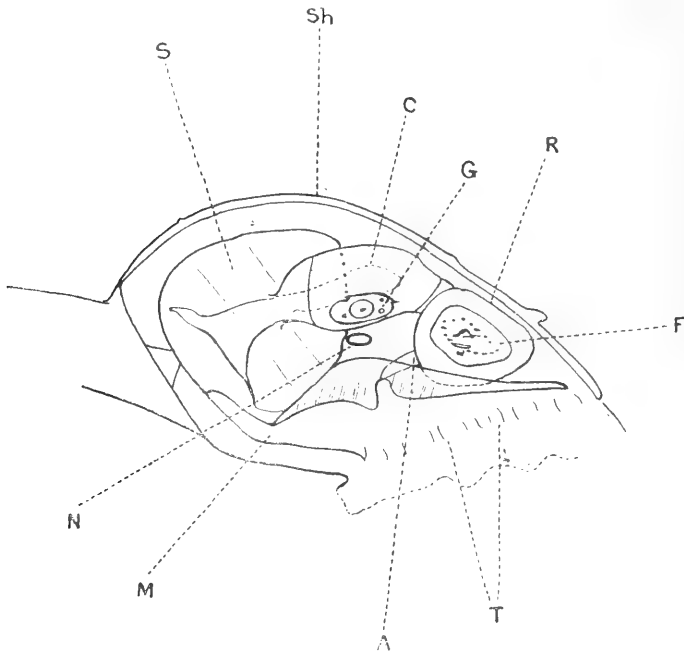


FIG. 5.—Anatomy of *L. colonialis*: A=anus; C=colon; F=fæcal pellet; G=young ovary; M=mouth; N=ganglion; R=rectum; S=stomach; Sh=aboral shield; T=base of tentacles.

#### *Calyx*—

Owing to the presence of the aboral shield, the calyx is more rigid and less liable to change in outline than is the case with some Entoprocta. It has an ovoid and slightly flattened shape, the flattening being in the plane at right angles to the main axis of the calyx. The cuticle is fairly thick, but smooth and quite transparent on what may be called, in *Loxosomatoides*, the oral surface of the calyx; on the aboral surface it is thickened and chitinized to form the aboral shield. The spines are variable in outline; as a rule they are bluntly pointed; when they are well developed their tips are pigmented. Otherwise the shield has a yellowish



colour in living polypides and in specimens preserved in spirit. In specimens which have been cleared with cedar-wood or clove oil and mounted in canada balsam, however, the whole shield practically disappears, unless some method of double staining is employed.

#### *Alimentary Canal—*

When the tentacles are unfolded the circle of the lophophore surrounds a relatively large vestibule, the floor of which is often rather deeply concave, its exact form depending on the state of the alimentary canal. It is covered with long cilia which waive towards the mouth, a large circular aperture situated at the lower end of the vestibule. The mouth leads into a funnel-shaped œsophagus, which opens in its turn into the stomach, to which it is at right angles; the opening is almost exactly in the middle of the anterior ("oral") surface of the stomach. There is no epistome. The colon, a wide tube which can be entirely shut off from the stomach by a constriction, starts from one side of the latter but bends round behind it in such a way that the rectum, which is separated from the colon by a distinct constriction, comes to lie parallel to the œsophagus. The rectum is capable of great contraction and often takes on a spherical outline. In this condition it does not

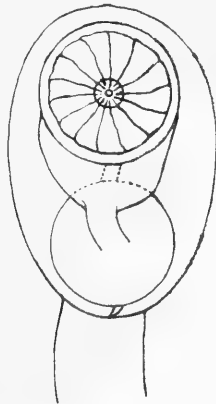


FIG. 6.—*L. colonialis*, polypide with retracted lophophore, from in front.

reach the floor of the vestibule but lies at the base of a narrow pit devoid of cilia. When the rectum is extended, however, the anus opens on the floor of the vestibule a short distance from its upper limits. Of all the divisions of the alimentary canal the stomach is by far the most bulky, filling up the greater part of the space in the calyx. Its anterior and posterior walls consist of greatly elongated cells; its base is fastened to the base of the calyx by means of a strand of tissue apparently resembling a dice-box in shape but very difficult to distinguish clearly as it takes all the stains I have tried on it feebly. The only part of the animal (except the shield) that is not absolutely colourless, is the stomach, which has a faint yellowish tinge,

*Gonads*—

The gonads arise as a pair of small reniform bodies, one lying on each side of the stomach. They branch as they develop, however, and become at first lobate, then dendritic, and finally form a broad zone, interrupted in front and behind, round the calyx, the branches being closely pressed together. All the colonies I have examined have been either male or female as colonies, but there were some indications in the female ones of protandry having occurred. I have not seen fully ripe ovaries or embryos, and am uncertain whether a brood-pouch exists.

*Nervous System*—

A relatively large ganglion exists near the centre of the calyx, in the bend of the alimentary canal, and sends off radiating nerves. Its position is the same as that occupied by the ganglion of *Pedicellina*.

*Musculature*—

I have been unable to detect muscles in the calyx, unless the structure joining the stomach to the base of the calyx is of this nature. The greater part of the stalk consists of vertical, nucleated muscle-fibres.

*Stalk*—

The stalk is covered by a smooth, minutely annulated cuticle, not very thin but quite transparent and colourless. Within the cuticle, for a short distance below the calyx, there is a single layer of flattened cells with nuclei that stain deeply; but this layer only extends for a short distance. The diaphragm is tangential to the main axis of the stalk. The remainder of the stalk apparently consists of a uniform mass of muscle-fibres. Whether flame-cells occur in this mass I am unable to say, not having cut sections. The calyx apparently dies at not very infrequent intervals and falls off, leaving a pointed tip to the stalk. A new calyx is then formed within the distal part of the stalk, apparently from that part of it which possesses a layer of flattened cells immediately within the cuticle.

*Movements*—

The movements of the polypide are slow, except in the case of the tentacles and sphincter muscle, which are folded in and contracted with great rapidity. The tentacles, when extruded, are usually held with their tips bent inwards towards the centre of the circle outlined by the lophophore, but they can be straightened out so as to lie parallel to the main axis of the polypide, and their tips can be applied together when they are fully extended, in order that food, consisting of various minute organisms, may be seized between them. I am indebted to my friend, Mr. F. M. Howlett, for the sketches reproduced in figure 7 and representing living polypides in various attitudes.

The calyx, when the tentacles are stretched out, either stands up vertically on the stem or is bent backwards so that its main axis is at right angles to that of the stalk and the lophopore is parallel or almost parallel to the stolon. When the animal is disturbed the calyx bends forwards and the aboral shield is presented in the direction from which danger threatens. At the same time slow writhing movements, which seldom cease altogether, cause the stalk to curl into a loose spiral with a single whorl. There is not, however, any nodding of the calyx such as takes place in some Entoprocta with deciduous calices.

#### *Affinities—*

In its mode of growth *Loxosomatoides* closely resembles *Pediclellina*, from which the direction of the lophophore at once distinguishes it; *Loxosoma* it only resembles in this one particular. The polypides bear a very close resemblance to young polypides

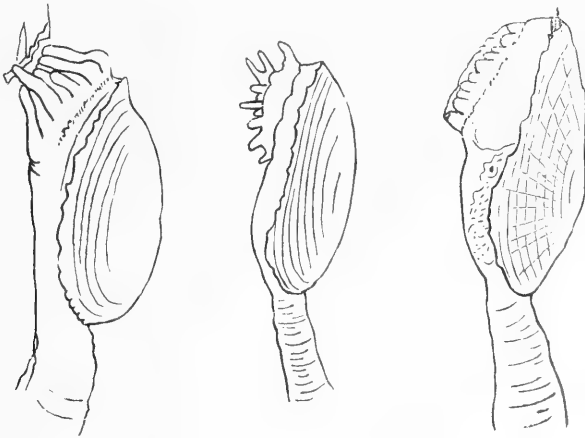


FIG. 7.

of the freshwater North American genus *Urnatella*<sup>1</sup> in which the stalk has not yet become segmented; this is particularly the case as regards the lophophore and the sphincter muscle. Probably, however, the closest affinities are with *Myosoma*,<sup>2</sup> in which an aboral shield is developed but extends down the aboral surface of the stalk. This genus, as its name is intended to indicate, is distinguished by the possession of definite muscles in the calyx, a character which I have been unable to detect in *Loxosomatoides*. The aboral shield of the new genus and of *Myosoma* is possibly homologous with the zoeonium of the Ectoprocta, but a study of its development would be necessary before it would be possible to make a definite statement on this point.

<sup>1</sup> Leidy, *Journ. Acad. Nat. Sci. Philadelphia*, ix (2), p. 5, pl. i, fig. 5, 1884.

<sup>2</sup> Robertson, "Studies in Pacific Coast Entoprocta," *Proc. California Acad. Sci.*, ii (3), p. 324, 1900.



## II.—DESCRIPTION OF A NEW DICTYONINE SPONGE FROM THE INDIAN OCEAN.

By R. KIRKPATRICK

(Plate i.)

On the occasion of a visit to the Indian Museum, Calcutta, I was kindly permitted by Dr. Annandale, the Superintendent of the Museum, to inspect the collection of Sponges. Among the treasures obtained from the Indian Ocean by the "Investigator," were several dictyonine sponges of very elegant and remarkable form, all belonging to a species which had not been described before. For reasons stated below I consider the species to come under *Eurete*, despite the fact that there is no "beautiful network" of anastomosing tubes, but simply a vertical hollow stem with hollow separate lamellæ. Dr. Annandale entrusted the material to me for description, and I propose to name the new species *Eurete annandalei*.

Family EURETIDÆ, F. E. Schulze.

Genus EURETE, Semper.

1868. *Eurete*, Semper. *Verhandl. Würzburg phys. med. Gesellsch.*, Neue Folge, band i. *Sitzb.*, July 18, 1868, p. xxix.  
 1887. *Eurete*, Schulze. "Challenger" Report, Hexactinellida, p. 289.  
 1899. *Eurete*, Schulze. *Amerikanische Hexactinelliden*, p. 106.  
 1904. *Eurete*, Wilson. *Mem. Mus. Comp. Zool. Harvard*, vol. xxx. No. 1, "Albatross" Exp., 1891, Sponges, p. 62.

*Eurete annandalei*, sp. nov.

Sponge in form of an erect, hollow, sub-cylindrical column with four vertical longitudinal series of lamellate branches at right angles to the central column and arranged in opposite pairs, each pair forming angles of  $50^{\circ}$  and  $130^{\circ}$  with the pair immediately above and below. Lamellate branches tubular at place of origin, then explanate and obcordate, and with thin margin; with a well-defined round orifice on the upper and under surface of each lamella. With two kinds of scopulæ, with small hexactins, and micro-discohexasters.

*Localities*.—One specimen,  $\frac{\text{Z.E.V. 1422}}{7}$  (fig. 2), from Lat.

$7^{\circ}55' \text{ N.}$ , Long.  $81^{\circ} 47' \text{ E.}$ , 506 fathoms; six specimens,  $\frac{\text{Z.E.V. 2145}}{7}$

(fig. 1), from Station 321, Lat.  $5^{\circ} 4' 8\frac{1}{2}''$  N., Long.  $80^{\circ} 22'$  E., 660 fathoms.

Of the seven specimens the best preserved is the broken one (B) depicted in fig. 2, in which many of the flesh spicules still remain, but neither in this nor the others are there any traces of the spicules of the dermal or gastral layers.

The other specimens consist only of the dictyonal network; and the central tube is mostly filled with mud.

In the longest specimen (A, fig. 1) the central sub-cylindrical column is 17 cm. in length, 1.4 cm. in diameter near the base, and 1 cm. in diameter at the upper end. The specimen rises from a solid disk-like base 3 cm. in diameter. In three of the smaller specimens the basal disk is perforated by an opening leading into the axial gastral cavity. The thickness of the wall of the central column varies from 1.1 to 1.2 mm. In the inner wall are four vertical rows of orifices leading to the lamellate branches.

In several of the specimens the lumen of the central tube is filled with mud; in one instance there are several minute Ophiurids. In five of the specimens the inner wall is smooth and the lumen bare of structure. The upper end of the central cylinder opens by an oval orifice with the long axis forming angles of  $50^{\circ}$  and  $130^{\circ}$  with the axis of the lamellar pair immediately below, and with the margins slightly flared out. In specimen A is an incomplete (?) vertical partition of slender dictyonal network, so that there is an appearance of a double tube. The presence of mud makes it difficult to discover whether the partition is complete or not; possibly at first there is a complete partition which becomes ruptured as the sponge grows. In specimen B there are, on the inner wall, alternating pairs of longitudinal vertical ridges situated on a level with the orifices leading to the branches and in a plane at right angles to them.

#### *The lamellate branches or lamellæ—*

The lamellæ are arranged at right angles to the central tubular axis, and in opposite pairs, each pair forming angles of  $50^{\circ}$  and  $130^{\circ}$  with the pair above or below it, the open or obtuse angle of the  $\times$  thus formed (fig. 8) being  $130^{\circ}$  and the acute angle  $50^{\circ}$ . A botanical colleague informs me that the four rows are orthostichous, and that the arrangement in opposite pairs alternately crossing, but not at right angles might be described as spuriously decussate. Looking down on the specimen from above, the wall of the central tube is visible along the course of the opposite obtuse angles, but is concealed by the overlapping lamellæ along the line of the acute angles. Again, viewed in front there is an appearance of bilateral symmetry, *i.e.*, of two series of alternating lamellæ on each side of the spaces bounded by the opposite obtuse angles; but the branches or lamellæ develop in opposite pairs, accordingly the bilateral symmetry is a secondary development.

Specimen A has twenty pairs of lamellæ, *i.e.*, four vertical series of ten.

The lamellæ, in the well-preserved specimen B, have a short, sub-cylindrical, laterally compressed stem; but this is less obvious in the other specimens, in which the branches come off at once as flat leaflets. The lamellæ are saddleshaped with the lateral edges curving downwards; accordingly, in the fragmentary specimen B, it was possible to see at a glance which were the upper and lower ends of the specimen.

The lowest and oldest branches are reduced almost to mere ridges. A fully formed lamella is 19 mm. long, and 18 mm. wide.

The single circular orifices on the upper and lower surfaces are 4 mm. in diameter, and with well-defined slightly raised rim.

The upper orifice, obliquely directed and pointing upwards and outwards, is further away from the central column than the lower, which points downwards and outwards. In two instances there is a third orifice near the upper edge, suggesting an atavistic return to the form of colony with anastomosing tubes such as is found in the less specialised species of *Eurete*.

The orifices on the lower surface of the lamella persist to a greater degree than those on the upper. Along one vertical series, for instance, all the ten lower surface ones are open, but only the four highest of the upper surface ones. In the orifices more recently closed up it is still possible to see the outline below the thin layer of dictyonal skeleton.

Several of the lamellæ in B have a denticulate process or tongue on the inner margin of the upper orifice and a larger one on the outer margin of, or quite external to, the lower orifice.

The lamellæ are hollow at their origin, but beyond the orifices the upper and lower laminæ meet to form a thin edge.

*The Skeleton.*—The dictyonal network does not present any striking peculiarities. The network has square or oblong meshes, sometimes of considerable length, below the surface; but at the surface the meshes form polygonal areas, each polygon being divided by spokes radiating from a centre, into triangular spaces.

From the nodes arise spines varying in length, shape, thickness and character of surface, but for the most part cylindrical, knobbed and slightly tuberculated, and sufficiently numerous to give the surface of the sponge a hirsute appearance to the naked eye. The spines round the lamellar orifices are very short and terminate in spherical knobs. Among these spines are numerous specimens of a Lituoline Foraminifer, which often so closely resembles the spines, that it is not easy to distinguish them from the latter. This organism is cylindrical, with a bulbous base, and with a surface layer of overlapping, fine, diamond-shaped, vitreous plates. The resemblance between the skeletal spines and the Foraminifer is so close as almost to suggest protective mimicry; though at the same time it is difficult to imagine how such a minute organism could profit in this manner.

The dictyonal network does not fine off at the growing edges into a single layer as commonly happens in *Farrea*, and rarely in *Eurete*.

*Spicules*.—Scopulæ of two kinds. 1. With four or five knobbed prongs (fig. 10),  $436\ \mu$  in total length, the prongs being  $62\ \mu$  long; the shaft, which is slightly swollen at the point of origin of the prongs, is roughened at the upper and lower end; the lower end is blunt-pointed; the prongs are coarsely granular; and the pyriform knobs provided with retrocedent spines; the shaft, which is swollen at the cladal origin, is roughened at the upper and lower ends; the lower end rather blunt-pointed usually; the prongs,  $62\ \mu$  long, are coarsely granular, and the pyriform knobs provided with retrocedent spines. 2. Scopulæ with lanceolate prongs (fig. 11), total length  $694\ \mu$ ; the whole surface smooth; shaft  $6.5\ \mu$  thick at centre, swollen at cladal end to  $11\ \mu$ . Prongs, usually five in number, smooth, lanceolate,  $82\ \mu$  in length.

I found both kinds of scopulæ on the dermal side, and was unable to make out any distinction between dermal and gastral scopulæ.

Small hexactins, varying a good deal in size, but with rays on an average  $400$  to  $450\ \mu$  in length, with finely spined surface.

Discohexasters  $44.5\ \mu$  in total diameter, with smooth primary rays  $6.25\ \mu$  long, each primary with four roughened curved, secondary rays  $16\ \mu$  long, each ending in minute disk with finely denticulate edge.

*Affinities*.—The new species in its general form comes nearer to *Eurete erectum*, F. E. Schulze (*l.c.*, *supra*, p. 106), and its varieties (Wilson, *l.c.*, *supra*, p. 62, *et seq.*), than to other species of the genus, but at the same time there are great differences.

In *E. erectum* there is a tendency to form a long axial growth rather than a clump of anastomosing tubes. In *E. erectum* var. *tubuliferum*, Wilson, there is only a single axis with lateral branches, as in the new species; in this variety the lateral branches are at first cup-like, with flaring edges, which latter in more developed branches curve over and meet in such a way as to leave an orifice at each end of the line of junction.

In *E. annandalei* a great degree of specialisation has arisen, the simple tube or cup expands into a hollow lamella in which the coalescent edges form the margin of a leaf-like lamina.

The upper and lower laminar orifices represent the openings left by the partial fusion of the edges of the simple tubular branch.

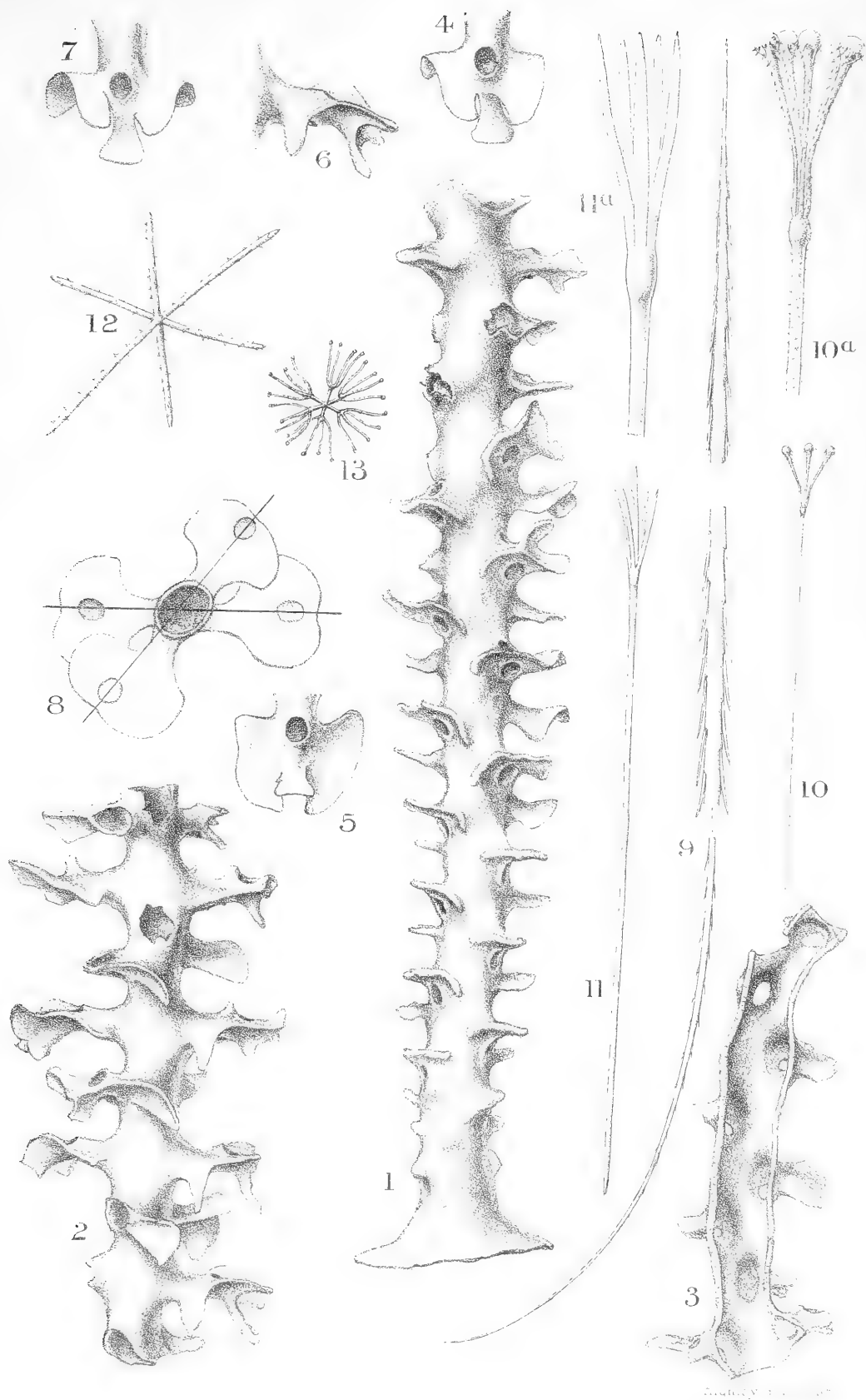
In spite of the high degree of specialisation attained in this species by the branches and their openings, it did not seem necessary to place the form under a new genus. In other Euretid sponges we find great divergence from the anastomosing tubular growth even within the limits of the same species, as in *Farrea occa* (Bowerbank) var. *laminaris*, Topsent (*Résult. Camp. Sci. Monaco*, fasc. xxv, p. 44, pl. vi, figs. 1, 2), and *F. occa* var. *joliascens*, Topsent (*Bull. Mus. Oceanograph. Monaco*, November 1906, p. 1).





### EXPLANATION OF PLATE I.

- FIG. 1.—*Eurete annandalei*, sp. nov. Specimen A, nat. size.  
,, 2.—Specimen B, nat. size.  
,, 3.—Section of a third specimen showing interior of axial column, nat. size.  
,, 4.—Upper surface of a lamella, nat. size.  
,, 5.—Under surface of same, nat. size.  
,, 6.—Side view of same, nat. size.  
,, 7.—Front view of same, nat. size.  
,, 8.—Diagrammatic transverse section to show angle at which branches cross.  
,, 9.—Uncinate,  $\times 160$ .  
,, 10.—Knobbed scopula,  $\times 160$ ; 10 a, cladal end of another spicule,  $\times 425$ .  
,, 11.—Lanceolate scopula,  $\times 160$ ; 11 a, cladal end of another spicule,  $\times 425$ .  
,, 12.—Hexactin,  $\times 160$ .  
,, 13.—Discohexaster,  $\times 425$ .



EURETE ANNANDALEI. n. sp.



### III.—NOTES ON FRESHWATER SPONGES.

By N. ANNANDALE, D.Sc., Superintendent, Indian Museum.

#### VIII.—PRELIMINARY NOTICE OF A COLLECTION FROM WESTERN INDIA, WITH DESCRIPTIONS OF TWO NEW SPECIES.

The following sponges were collected in November last in the Gwalior Tank, Bombay, in the lake and in a small pond at Igatpuri in the Western Ghats, and in the Godaveri River at Nasik on the eastern side of the same range of hills.—

- Spongilla lacustris*, auctorum, in a pond at Igatpuri.
- „ *cinerea*, Carter, on stones in the Godaveri at Nasik.
- „ *carteri*, Bowerbank, in different situations at Bombay and Igatpuri.
- „ *bombayensis*, Carter, on stones in the lake at Igatpuri.
- „ *indica*, sp. nov., on stones in the Godaveri at Nasik.
- „ *lapidosa*, sp. nov., together with the last and on stones at Igatpuri.

*Ephydatia indica*, Annandale, on stones in a pond at Igatpuri.

The specimens of *Spongilla lacustris* are small, but typical; those of *S. cinerea*, *S. carteri*, *S. bombayensis* and *Ephydatia indica* I have compared with types or co-types. A full account of the collection will be published later, but the following preliminary descriptions will serve as diagnoses of the two new *Spongilla* represented. The types are in the collection of the Indian Museum, but co-types will be sent to the British Museum.

*Spongilla indica*, sp. nov.

Closely allied to *S. sumatrana*, Weber.

Sponge forming a very thin layer, of a bright green or pale grey colour; surface smooth, minutely hispid; pores and oscula inconspicuous, the latter approached in some instances by radiating furrows; subdermal space small; texture compact, rather hard. Skeleton incoherent, somewhat massive owing to the large number of spicules present; spicules forming triangular meshes and occasionally arranged in vertical lines several spicules broad but without spongin. Skeleton spicules straight or nearly straight, slender, cylindrical, amphistrongylous, uniformly covered with minute, sharp spines; flesh spicules slender, sharply pointed, straight or curved, irregularly covered with relatively long, straight, sharp spines,

abundant in the dermal membrane, scarce in the substance of the sponge. Gemmules spherical, somewhat variable in size, with a single aperture, which is provided with a trumpet-shaped foraminal tubule and is situated at one side of the gemmule in its natural position; the inner chitinous coat devoid of spicules, closely covered by an outer coat composed of a darkly coloured chitinous substance, in which the gemmule spicules are embedded, lying parallel or almost parallel to the inner coat. The outer coat forms a kind of mantle by means of the skirts of which the gemmule is fastened to the support of the sponge and which is pierced by the foraminal tubule;

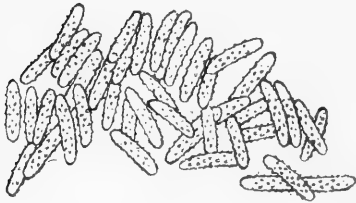


FIG. 1.

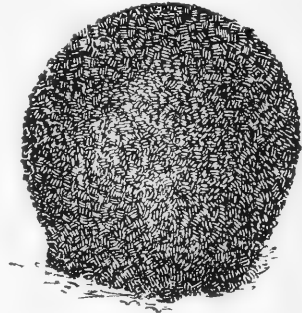


FIG. 2.

FIGS. 1 AND 2.—*Spongilla indica*: fig. 1 = group of gemmule spicules,  $\times 240$ ; fig. 2 = a gemmule,  $\times 70$ .

gemmules distinct from one another; gemmule spicules short, stout, sausage-shaped, covered with minute, straight spines, which are sometimes absent from the extremities.

Average length of skeleton spicules	..	0.2046 mm.
„ breadth of skeleton spicules	..	0.0172 „
„ length of flesh spicules	..	0.053 „
„ breadth of flesh spicules	..	0.0053 „
„ length of gemmule spicules	..	0.044 „
„ breadth of gemmule spicules	..	0.0079 „

*Spongilla lapidosa*, sp. nov.

Allied to *S. loricata*, Weltner.

Sponge encrusting; black or grey, extremely hard, its surface with occasional groups of spicules projecting; dermal membrane adhering closely to the surface; oscula very small, sometimes conspicuously elevated. Skeleton incoherent, broad groups of spicules arranged vertically occurring irregularly but being devoid of any binding substance and only traversing a small part of the thickness of the sponge; transverse fibres absent; in the inferior part of the sponge the direction of a large proportion of the spicules is horizontal, the number arranged vertically being greater in the upper part. Skeleton spicules sausage-shaped, sometimes slightly swollen at the ends, as a

rule smooth but occasionally a little rough, variable in proportions, probably slender and pointed when young. Gemmule spicules sausage-shaped, covered with short, straight spines, which are sometimes absent from the extremities, variable in length. Flesh spicules birotulate, usually occurring in groups; their shafts smooth, slender, straight or curved, variable in length; their rotulæ consisting of six or seven backwardly curved spines. Gemmules congregated in groups at the base of the sponge, oval or sausage-shaped, with a single depressed aperture situated on one of the longer sides; each gemmule contained in an oval case of spicules and a dense chitinous

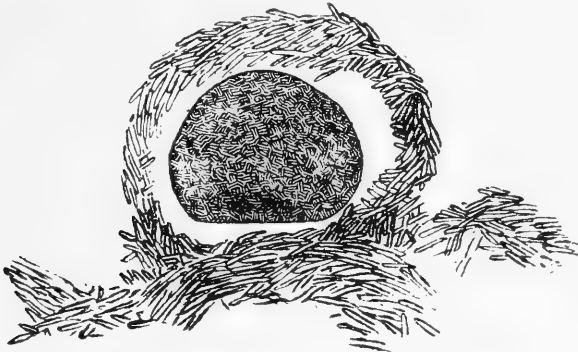


FIG. 3.—Gemmule of *Spongilla lapidosa* in its case, the roof of which is omitted, from below,  $\times 30$ .

substance, and having, apart from this, only an inner coat, in which the spicules are embedded horizontally like a mosaic; the case consisting of an inner layer of skeleton spicules, occasionally mixed with birotulate flesh spicules, and an outer one formed of gemmule spicules massed together irregularly and held in position by the chitinous substance, the side walls of each case being partly coincident with those of others. There is a dense membrane at the base of the sponge with which the outer layer of the gemmule cases is in continuity.



FIG. 4.



FIG. 5.

FIGS. 4 AND 5.—*Spongilla lapidosa*: fig. 4=sausage-shaped gemmule,  $\times 30$ ; fig. 5 = a group of spicules from the same,  $\times 240$ .

Measurements of skeleton spicules	..	From $0\cdot279 \times 0\cdot079$ to $0\cdot231 \times 0\cdot0186$ mm.
„ flesh spicules	..	Length of shaft from $0\cdot159$ to $0\cdot046$ mm. Breadth of shaft= $0\cdot0026$ mm. Diameter of rotule = $0\cdot0106$ mm.
„ gemmule spicules	..	$0\cdot026$ to $0\cdot039 \times 0\cdot0106$ mm.
„ gemmules	..	$0\cdot38 \times 0\cdot29$ to $0\cdot55 \times 0\cdot25$ mm.



#### IV.—REMARKABLE CASES OF VARIATION.

By R. E. LLOYD, M.B., B.Sc., Capt., I.M.S., formerly Surgeon  
Naturalist, Marine Survey of India.

##### I.—*SQUILLA* INVESTIGATORIS.

Anyone who examines large numbers of animal organisms and attempts to fit them into the established specific groups, must be sometimes in doubt as to the propriety of placing certain of them into any particular group. This doubt is by no means always felt. As a rule organisms can be readily placed in established groups, or new ones or species defined for their reception. Occasionally, however, a number of individuals are found living together in the same environment, and resembling one another so closely in most respects that we hesitate to place them in more than one species, although in certain particular features they differ widely, one from the other. To establish several species for such a collection seems most inappropriate, for by so doing the offspring of even the same parents might be described as different species. If certain of the crustacea here described had been taken from widely separate localities there is no doubt that they would have been regarded as separate species. Animals which show such a wide range of variation are rare in comparison with ones showing a limited range, but they undoubtedly occur. They are perhaps less uncommon among the marine fauna of tropical seas than in other environments.

During the early part of 1906, the R.I.M. Survey ship "Investigator" trawled at ten stations along the south-west coast of Arabia. At one of these (Lat.  $15^{\circ} 8' 30''$  N. Long.  $51^{\circ} 52' 15''$  E.), from a depth of 110 fathoms, a very large number of a species of *Squilla* was obtained. It is much to be regretted that the interesting features of the species were not recognised at the time of their capture, and that only some twenty complete specimens were retained. Seventeen of these are now available for examination in the Indian Museum; this number, however, is quite sufficient to illustrate the remarkable variability of the species.

The seventeen specimens resemble one another very closely in all parts of their outer structure with one exception. The number of spinous teeth on the dactyle of the raptatorial claw varies from ten to eighteen among this small collection of seventeen individuals. Furthermore, as regards this appendage, they show no less than eleven different types displayed in the following table:—

Type.	TEETH PRESENT IN TYPE.		Number of individuals of the type.
	Left claw.	Right claw.	
1	10	16	1 (figured, pl. iii).
2	13	13	3
3	14	13	1
4	14	14	2
5	15	15	2
6	16	15	1
7	16	16	3
8	16	17	1
9	17	16	1
10	17	17	1
11	17	18	1
TOTAL			17

Besides this great variation in the number of teeth, their curvature and proximity one to the other are very variable. It was thought well to illustrate them fully (plate ii). The dactylus, in each case, was drawn under a low power of the microscope by the aid of the camera lucida. The resulting outline drawings, which were each twelve times the size of the object they represented, were reduced in the process of reproduction to more convenient dimensions. By these means accurate figures were obtained.

Owing to the great similarity of all their other features and to the fact of their community, they were regarded as one species and described as such under the name *Squilla investigatoris* (*Rec. Ind. Mus.*, i, p. 10), though it is impossible to say whether the species has 13, 14, 15 or 16 teeth on its claw. Perhaps if larger numbers were available, a clear majority might be found to possess claws bearing teeth to the value of only one of these numbers. A remarkable feature of this variation is that it occurs in an organ which is very stable in other species of the genus.

The genus *Squilla* has been defined as having no more than six teeth on the raptatorial claw, but in spite of this there can be little doubt that this variable species has been correctly assigned to the genus *Squilla*.

In his report on the "Challenger" *Stomatopoda* Brooks defines the genus as follows :—

2. Dactyle of raptatorial claw not dilated at the base, but usually armed with marginal spines.

- (1) Primary marginal spines of the telson small, with no more than four secondary spines between the submedian and the intermediate; outer

spine of the basal prolongation of the uropod usually longer than the inner; dactyle of raptatorial claw with not less than six marginal spines .. ..

.. Genus *Lysiosquilla*.

- (2) Primary marginal spines of telson large, with more than four secondary spines between the intermediate and the submedian; inner spine of the basal prolongation of the uropod longer than the outer; dactyle of the raptatorial claw usually with no more than six marginal spines .. ..

.. Genus *Squilla*.

Bigelow, in a report on the Stomatopods collected by the "Albatross," follows Brooks in his definition of the genus (*Proc. U. S. Nat. Museum*, vol. 17, 1894).

Of the three features chosen to define *Squilla* from *Lysiosquilla*, the "Investigator" species exhibits only two, for *Lysiosquilla* is the genus which possesses; according to the above definition, not less than six raptatorial spines (some species of this genus have ten). In the form of the telson and uropods, however, the new species is obviously a true *Squilla*; the figure (plate iii) shows this better than any verbal description.

At least two other species of *Squilla* possess a larger number of raptatorial teeth than six. *Squilla raphidea*, a very widely distributed species, has eight: *S. armata* is referred to by Bigelow (*ant. cit.*) as having, "7 to 9 teeth on the raptatorial claw, rarely 6"; this species evidently resembles *S. investigatoris* in the nature of its variability, though this occurs to a less degree in the former species.

Except for these two species the genus *Squilla* seems to be remarkably constant as regards the raptatorial claw. In order to test and illustrate the stability of this appendage, the number of teeth on the claws of all the *Squillas* in the Indian Museum was counted. The collection is a large one and in excellent order; as can be seen from the following list, it has been gathered from eastern tropical seas in a wide sense, though chiefly from the Bay of Bengal and the Arabian Sea. It should be mentioned that all of one species from one named locality have been included in one group, although they may have been received from different donors at different times. For example, the 71 specimens of *S. interrupta* from Hongkong were received on four separate occasions, the 39 specimens of *S. hemischista* were obtained from three separate stations on the Orissa coast; the same may be said of the 55 specimens of *S. hemischista* from Madras. Although included in one group the specimens were

probably collected from widely separate places. Only species of the true genus *Squilla* have been included. *Lysiosquilla*, *Pseudo-squilla* and *Protosquilla* were not counted.

Species.	Locality	Number of normal specimens.	Number of abnormal specimens.
<i>S. interrupta</i>	Sandheads (mouth of Hooghly).	15 ( $\frac{6}{6}$ )	0
"	Hongkong	71 ( $\frac{6}{6}$ )	2 ( $\frac{6}{5}, \frac{6}{7}$ )
"	Karachi	14 ( $\frac{6}{6}$ )	0
"	Bombay	18 ( $\frac{6}{6}$ )	0
"	Orissa coast (B. of Bengal)	3 ( $\frac{6}{6}$ )	0
"	Mutlah light (mouth of Hooghly).	1 ( $\frac{6}{6}$ )	0
"	Singapore	3 ( $\frac{6}{6}$ )	0
"	Akyab (Burma)	1 ( $\frac{6}{6}$ )	0
"	Camorta I. (Nicobars)	1 ( $\frac{6}{6}$ )	0
"	Vizagapatam coast	1 ( $\frac{6}{6}$ )	0
<i>S. affinis</i>	Hongkong	19 ( $\frac{6}{6}$ )	0
"	Yokohama	1 ( $\frac{6}{6}$ )	0
"	Nagasaki	1 ( $\frac{6}{6}$ )	0
<i>S. holoschista</i>	Madras	28 ( $\frac{6}{6}$ )	3 ( $\frac{5}{6}, \frac{6}{7}, \frac{6}{9}$ )
"	Sandheads	1 ( $\frac{6}{6}$ )	0
"	Colombo	2 ( $\frac{6}{6}$ )	0
"	Vizagapatam	1 ( $\frac{6}{6}$ )	1 ( $\frac{7}{6}$ )
<i>S. hemischista</i>	Madras	55 ( $\frac{6}{6}$ )	0
"	Orissa coast	39 ( $\frac{6}{6}$ )	1 ( $\frac{5}{6}$ )
"	Sandheads	4 ( $\frac{6}{6}$ )	0
"	Cochin	8 ( $\frac{6}{6}$ )	0
"	Penang	4 ( $\frac{6}{6}$ )	0
"	Singapore	1 ( $\frac{6}{6}$ )	0
"	Ganjam coast	1 ( $\frac{6}{6}$ )	0
"	Bombay	2 ( $\frac{6}{6}$ )	0
"	Ganjam port	8 ( $\frac{6}{6}$ )	0
"	Vizagapatam coast	4 ( $\frac{6}{6}$ )	0
"	Hongkong	2 ( $\frac{6}{6}$ )	0
<i>S. stridulans</i>	Orissa coast (68 fathoms)	17 ( $\frac{6}{6}$ )	0
"	"B. of Bengal" (240 fathoms).	2 specimens, only one claw present, bearing 6 spines.	
"	Godavery coast (95 fathoms).	4 ( $\frac{6}{6}$ )	0
<i>S. multica rinata</i>	Hongkong	8 ( $\frac{5}{5}$ )	0
<i>S. tenuispina</i>	Arakan coast	1 ( $\frac{4}{4}$ )	0
"	Off L. Andaman I. (188 fathoms).	3 ( $\frac{4}{4}$ )	0
"	Ganjam coast	1 ( $\frac{4}{4}$ )	0
"	Godavery coast (95 fathoms).	2 ( $\frac{4}{4}$ )	0

Species.	Locality.	Number of normal specimens.	Number of abnormal specimens.
<i>S. leptosquilla</i> (closely resembling <i>S. tenuispina</i> ).	"B. of Bengal" (270—419 fathoms).	3 ( $\frac{4}{1}$ )	0
<i>S. polita</i>	Madras ..	13 ( $\frac{6}{6}$ )	1 ( $\frac{7}{6}$ )
"	Pondicherry ..	3 ( $\frac{6}{6}$ )	0
"	Bombay ..	1 ( $\frac{6}{6}$ )	1 ( $\frac{5}{5}$ )
"	Hongkong ..	2 ( $\frac{6}{6}$ )	0
"	Orissa coast ..	1 ( $\frac{6}{6}$ )	0
<i>S. fasciata</i>	Andamans ..	1 ( $\frac{6}{6}$ )	0
<i>S. gorypetes</i>	Cheduba straits (Burma)	1 ( $\frac{6}{6}$ )	0
<i>S. gilesii</i>	"B. of Bengal" (65 fathoms).	4 ( $\frac{6}{6}$ )	0
<i>S. scorpio</i> ( <i>immaculata</i> ).	Hooghly estuary ..	7 ( $\frac{5}{5}$ )	0
<i>S. scorpio</i> ( <i>genuina</i> )	Karachi ..	1 ( $\frac{5}{5}$ )	0
"	Bombay ..	1 ( $\frac{5}{5}$ )	0
<i>S. raphidea</i>	Mergui ..	3 ( $\frac{8}{8}$ )	1 ( $\frac{9}{9}$ )
"	Bombay ..	14 ( $\frac{8}{8}$ )	0
"	Sandheads ..	10 ( $\frac{8}{8}$ )	0
"	Rangoon ..	1 ( $\frac{8}{8}$ )	0
"	Andamans ..	1 ( $\frac{8}{8}$ )	0
"	Singapore ..	1 ( $\frac{8}{8}$ )	0
"	Persian Gulf ..	1 ( $\frac{8}{8}$ )	0
"	Karachi ..	1 ( $\frac{8}{8}$ )	0
"	Hongkong ..	23 ( $\frac{8}{8}$ )	0
"	Gulf of Martaban (61 fathoms).	1 ( $\frac{8}{8}$ )	0
"	Off Cape Negrais (Burma)	1 ( $\frac{8}{8}$ )	0
<i>S. ovatoria</i>	Bombay ..	1 ( $\frac{6}{6}$ )	0
<i>S. supplex</i>	" ..	1 ( $\frac{5}{5}$ )	0
<i>S. chlorida</i>	Hongkong ..	6 ( $\frac{6}{6}$ )	0
<i>S. foveata</i>	Ye (Burma) ..	1 ( $\frac{6}{6}$ )	0
TOTAL	19	63	451

The 451 specimens are, therefore, remarkably stable as regards number of raptatorial teeth. Variations from the normal type of the species only occurring to the extent of about 2 per cent. In their other features the members of this collection seem also very stable, and in these other features *S. investigatoris* is itself very stable: for example, on the outer border of the tail of a *Squilla* (exopod of uropodite) are eight movable spines; this number is very constant throughout the genus, and all of the seventeen specimens of *S. investigatoris* possess eight spines in this situation. The stability of this feature is in striking contrast to the variability of the claw in the same species.

The following facts seem, therefore, to be well established :—

- (1) The great variability of one feature (the raptatorial claw) in a particular race of the genus *Squilla*.
- (2) The comparative stability of the same feature in other races of the genus from neighbouring seas.

In reference to the same subject the following statements may also be made, though the supporting evidence is much less sure :—

- (3) This variable race of the genus is very common in one locality ; but is rare (or does not occur) outside that locality.

No exception can be taken to the first part of this statement. The number of specimens actually taken at one haul of the net was recorded as over 500. It is not usual to obtain a new species in such large numbers, though the records of deep-sea dredging show similar results from time to time.

The second part of the statement, that this variable race is rare outside the particular locality where it was found, is, of course, open to the objection that the fauna of Indian seas is very imperfectly known. How far this is true of the genus *Squilla* is fully shown in the above table, which shows the wide distribution of some of the species on both sides of the Indian Peninsula.

- (4) This variable race occupies an environment (beneath 110 fathoms of water, far from terrestrial influences) which must be comparatively constant in any one place, through considerable periods of time : furthermore, the circumstances of this environment cannot differ widely from those met with close to the 100-fathom line in neighbouring seas.

This statement does not rest on any definite evidence, though it appears generally true that the conditions of life beneath 100 fathoms of water must be less liable to change than in very shallow water or on land.

The genus *Squilla* is usually found in shallow water. It is comparatively rare in depths of over 50 fathoms. In the above list, the depth has been noted in the case of specimens taken from other than shallow water. It is not likely that increased depth of water could in itself produce variation in the direction of an increase of raptatorial spines. That it has no such influence is shown by the species *S. stridulans*, which has been taken from 68, 240 and 95 fathoms but shows only six raptatorial teeth, still more so by the species *S. tenuispina* and *S. leptosquilla* which have been taken from 188, 95, 270 and 419 fathoms, for these species have only four teeth.

#### *Theoretical considerations.*

Taking into consideration the number of teeth on the raptatorial claw of all the known species of *Squilla*, it is difficult to believe

otherwise than that this variable and many-toothed species has been derived from a form which had a smaller number of teeth. This number was probably six, for this is most common throughout the genus.

One who holds strictly to the idea that such changes are brought about by the perpetuation and accumulation of minute variations which occur in any direction, must suppose that the widely distributed members of the genus are kept constant as regards number of teeth, because that number suits some peculiarity of their environment. Any individuals showing variations from that number are usually unable to reach maturity, for abnormal specimens appear among a collection of adults to the extent of only 2 per cent.

In order to explain how a form having fifteen teeth was derived from one having but six, one must believe, if the theory of gradual change is true, that a series of ancestors having 7, 8, 9... 15 teeth must have existed. Starting from the point when the six-toothed form gave rise to one having seven teeth, one must imagine a change in the environment which favoured the few seven-toothed variations, so that few as they were among the myriads of young, a comparatively large percentage of them began to reach maturity and to transmit the new character to their offspring, until seven-toothed adults formed a majority and a new species was formed.

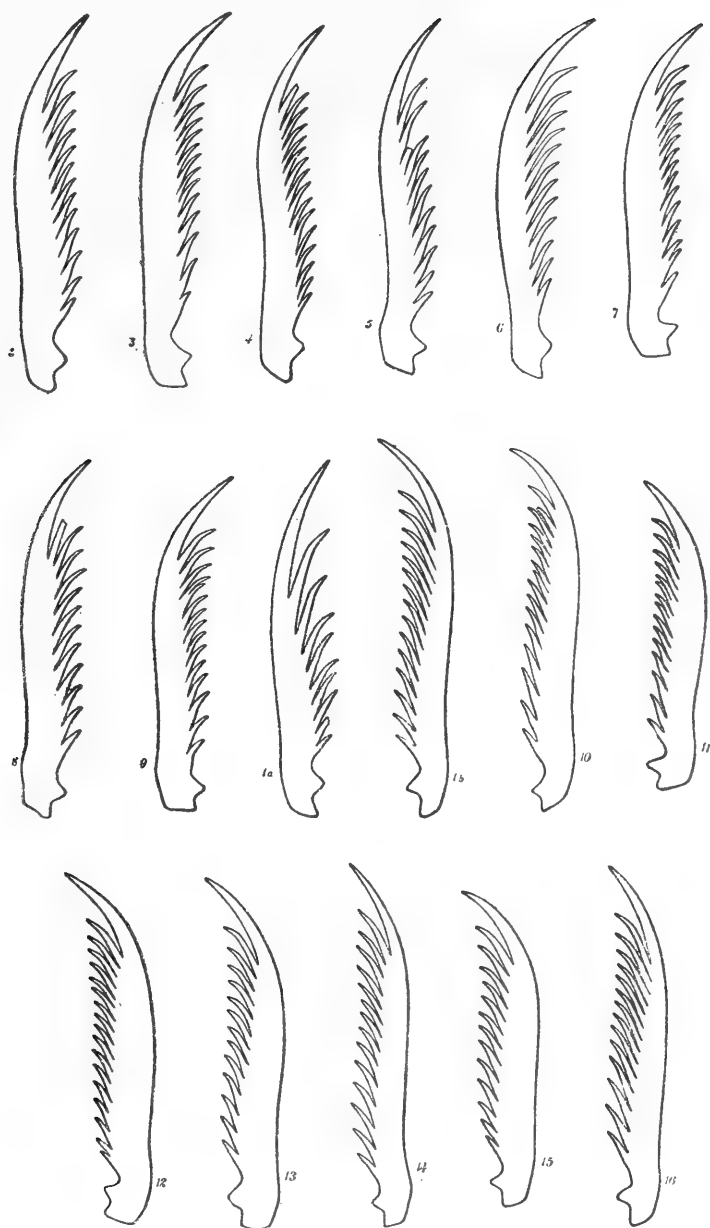
By a like process this gave rise to a species having eight teeth. The change of environment which caused the production of the seven-toothed form out of the six-toothed, could not produce the eight-toothed form from the seven-toothed. To produce this a further change in the environment appears to be necessary. This change must have been similar in nature to the first change, for it produced a like effect, but it must have been of increased intensity. If it were not so, the race would remain seven-toothed. In other words there must have been a continuous and increasing change of some particular feature of the environment to have caused the change in number of teeth from six to fifteen. What this change could have been is not easy to imagine. The supposition might be made of a gradual diminution in the size of the favourite prey, favouring an increase in number of the raptatorial teeth. However, if one examines, side by side, the claw of a *Squilla* with six teeth, and that of one with fifteen teeth, it seems impossible to imagine a small animal which could escape from either when the dactyle is closed down into its opposing groove; still less can this supposition account for an increase of one tooth at a time.

The facts of the case, which do not seem to be in favour of the "Theory of gradual change," are recorded here as a contribution to the study of animal variation available for comparison with similar cases which may be recorded.

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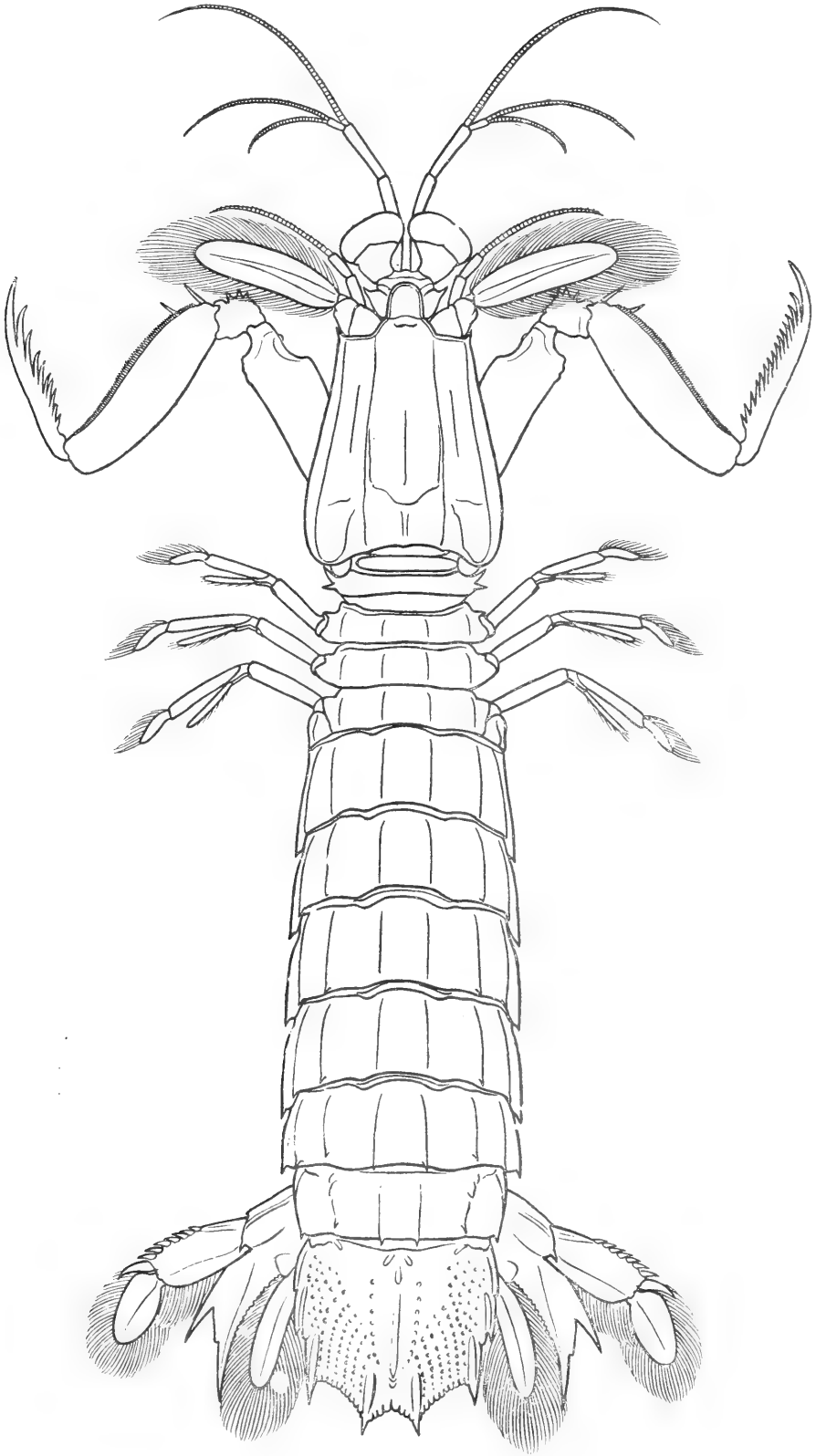




The dactyles of sixteen specimens of *Squilla investigatoris* drawn with the camera lucida,  $\times 4$ . 1a and 1b are the left and right dactyles of the specimen shown on plate iii.

Certain of the figures (notably 9, 10 and 11) show a tendency for the teeth to be distributed in pairs as though increase in the number of teeth has been brought about by duplication in the middle of the series.





Mondul del. SQUILLA INVESTIGATORIS,  $\times 2$ .



V.—DESCRIPTION OF A NEW SPECIES OF  
LIZARD OF THE GENUS *SALEA*  
FROM ASSAM.

By N. ANNANDALE, D.Sc., Superintendent, Indian Museum.

The range of the genus *Salea* was thought until recently to be confined (with a possible extension into Ceylon) to Southern India, where two species (*S. horsfieldii* and *S. anamallayana*) occur. In my "Notes on the Oriental Lizards in the Indian Museum" (*loc. post. cit.*, p. 81), however, I recorded two specimens from North-Eastern India, one collected by the late Dr. Stoliczka at Moulmein in Lower Burma and one by Col. Godwin Austen in North Assam. The former specimen, a female, agrees in every respect with examples of *S. horsfieldii* from the Nilgiris, but the latter must, I now think, be recognized as the type of a new species, which is here described.

*Salea austeniana*, sp. nov.

*S. horsfieldii*, Gray, Annandale (partim), *Journ. Asiat. Soc. Bengal*, 1905, p. 86.

Habit rather stout, the adpressed hind limb reaching the anterior border of the orbit; tail compressed. Tympanum about half as large as the orbit, its distance from which is distinctly less than the length of the snout; width of the orbit a little less than the length of the snout; canthus rostralis and superciliary ridge angular; snout slightly concave above, sloping. A curved fold covered with granular scales in front of the shoulder; scales on the back and sides of diverse sizes, bluntly pointed, occasionally split at the tip, rather feebly keeled, relatively broad; ventrals triangular, without a terminal spine, feebly keeled, strongly imbricate; gulars smooth, no larger than some of the ventrals; scales on the upper surface of the limbs and the lower surface of the tail strongly keeled. Dorsal and nuchal crests continuous, consisting of a single row of scales (in the female) which are lanceolate on the neck and triangular on the body, continued on the tail as a slightly serrated ridge. Colour dull green mottled on the sides with brown and diversified on the head with the following markings: a narrow longitudinal line between the eyes that bifurcates in front and behind, the anterior bifurcation forming the two posterior sides of a lozenge in outline on the snout, and the posterior one the two equal sides of an isosceles triangle on the back of the vertex; two slanting-shaped lines on the supraocular regions, one on each side; a dark streak extending from the lower posterior limit of the

orbit nearly to the nape; a series of fine lines radiating from the eye.

*Locality*—Hills near Harmatti, Assam.

The type (apparently a female) was collected during the Dafla Expedition of 1874-75, and is numbered 3976 in the Indian Museum register of reptiles. Its dimensions are as follows :—

Length of head and body	..	..	..	90 mm.
Width of head	..	..	..	14 „
Length of snout	..	..	..	10 „
Width of orbit	..	..	..	8 „
Length of tail	..	..	..	230 „
Length of fore limb	..	..	..	52 „
Length of hind limb	..	..	..	76 „

Boulenger's "key" to the genus in *Faun. Brit. Ind., Reptiles*, p. 131, will have to be emended as follows to include the new species :—

A. No fold in front of the shoulder.

(a) Snout not more than once and a half as long as the diameter of the orbit .. .. *S. horsfieldii*.

B. A fold in front of the shoulder.

(a) Snout nearly twice as long as the diameter of the orbit .. .. *S. anamallayana*.

(b) Snout only slightly longer than the diameter of the orbit .. .. *S. austeniana*.

Mr. L. L. Fermor, of the Geological Survey of India, has recently sent to the Museum a specimen of *S. horsfieldii* captured at the height of 8,000 feet in the Nilgiris.

## VI.—THE FAUNA OF BRACKISH PONDS AT PORT CANNING, LOWER BENGAL.

### PART VIII.—PRELIMINARY DESCRIPTION OF AN OLIGOCHÆTE WORM OF UNCERTAIN POSITION.

By J. STEPHENSON, Major, I.M.S., Professor of Biology,  
Government College, Lahore.

The worm which forms the subject of the following notice was sent to me along with a colony of *Victorella pavid*a (on which, as well as on *Bowerbankia caudata* and *Loxosomatoides*, it lives) by Dr. Annandale, having been found by him in the brackish pools at Port Canning. The specimens were in a good state of preservation; but, with the exception of the general outlines of the alimentary canal, details of internal anatomy are scarcely to be recognised in preserved specimens; and the following description has mainly to do with the general external characters and the setæ.

The worms were whitish in colour, and measured (probably in a somewhat contracted condition) from 1·5 to 4·5 mm. in length; the average was from 3 to 4 mm. There is a well-marked prostomium, bluntly conical in shape; the anterior part of the body is somewhat swollen in an ovoid manner; then follows a short, slightly constricted region; after which the body, enlarging again, maintains a cylindrical shape to the posterior end. It is possible that in preserved specimens the anterior end appears more swollen than during life, since the setal bundles are placed closer together here; the anterior portion of the body having contracted more, probably, than the posterior. There are no eyes.

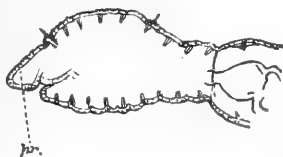


FIG. 1.—Side view of anterior part of body, showing the arrangement of the setal bundles of one side: *pr.*, prostomium.

The number of segments varies from about 20 to about 30. The posterior, regularly cylindrical part of the body is constituted by all the segments after the tenth, the anterior ovoid portion comprises the first eight or nine, and the constricted region

consists of the tenth and perhaps the ninth segment also. In the anterior part of the body the segments may be delimited on the ventral surface by a series of narrow, groove-like, transverse markings.

There are two dorsal and two ventral setal bundles in all segments from the second onwards. The setæ are of two kinds, hook-setæ and needle-setæ; the most anterior bundles, both dorsal and ventral, consisting of needle-setæ, the posterior of hook-setæ.

The needle-setæ are from  $\cdot 08$  to  $\cdot 12$  mm. in length, finely pointed, not bifid, the extreme point being slightly recurved. They are somewhat bayonet-shaped, and appear to be definitely strengthened or thickened along the convexity of the angle of their chief curve (v. text-fig. 2). They project from the body-wall for about half their length, that is, from the region of the angle; the angle looks forwards, and the distal pointed extremity backwards

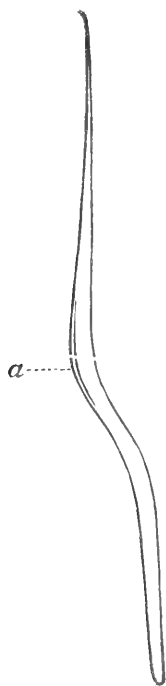


FIG. 2.



FIG. 3.

FIG. 2.—A needle-seta: *a.*, Apparent ridge-like thickening of needle-seta at its most prominent angle.

FIG. 3.—A hook-seta: *b.*, the slightly thicker part of the hook-seta, near its free end.

The hook-setæ are from  $\cdot 033$  to  $\cdot 055$  mm. in length. In the most anterior segments (vi—viii) in which they occur, they are longer ( $\cdot 05$ — $\cdot 055$  mm.) than is the case posteriorly (mostly  $\cdot 035$ — $\cdot 04$  mm.). They are bifid at the free end; the proximal prong of the fork is considerably longer and stouter than the distal, and its axis is about at right angles to the shaft of the seta. There



is a nodule at the junction of the middle and distal thirds of the shaft, and between the nodule and the terminal hook the shaft is again slightly thickened. The proximal portion of the shaft shows a gentle curve in a direction the reverse of that of the hook, the whole being thus somewhat  $\int$ -shaped (v. text-fig. 3). These setæ project very slightly from the surface of the body.

The dorsal bundles as far as the seventh segment are generally (or always, with perhaps the exception of the seventh itself) made up of needle-setæ alone; the eighth segment may bear dorsally either needles, or hooks, or both; the ninth and succeeding segments bear hooks only. The ventral bundles, as far as the fifth segment, have only needle-setæ; those of the sixth and seventh, needles, or hooks, or both; posterior to this the ventral bundles consist of hooks only. The needle-setæ, therefore, extend somewhat further back dorsally than ventrally.

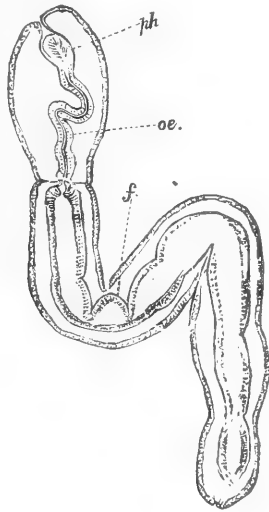


FIG. 4.—Showing the general shape and the outlines of the alimentary canal; the setæ are not shown: *f.*, black particles in intestinal wall; *œ.*, œsophagus; *ph.*, pharynx.

The number of setæ in a bundle is three or four in the anterior and middle portions of the animal's length, diminishing to two or one at the posterior end.

The pharynx is a somewhat globular organ in the second and third segments; the œsophagus, a narrow tube with comparatively thick walls, forms in the preserved specimens a series of curves, passing through a stout septum behind the tenth segment (septum  $\frac{10}{11}$ ), and widens abruptly into the intestine. This latter tube may be regularly dilated and constricted throughout a large part of its length, the constrictions being probably due to its passage through the septa. The epithelium shows within its component cells, through a large part of its extent, a number of fine black particles (text-fig. 4).

Although no signs of asexual reproduction have been seen in any of the specimens so far examined, the general appearance and structure of the worm would seem to indicate that it belongs to the Naididæ. The peculiar arrangement of setæ has not, so far as I know, been described in any form hitherto known; and I would therefore propose for its reception the creation of a new genus *Matla*, adopting for this purpose the native name of Port Canning, where the animal was found; as its specific name I would suggest *bengalensis*. Both these names I owe to the kindness of Dr. Annandale, who discovered the worm and gave me the opportunity of examining it.

VII.—DESCRIPTION OF A NEW CAVERNICO-  
LOUS PHASGONURID FROM  
LOWER SIAM.

By W. F. KIRBY, *British Museum (Nat. Hist.)*.

*Diestrammena annandalei*, sp. nov.

Female brownish chestnut, rather shining, the segments of the abdomen often banded with brown behind; legs lighter than the body, indistinctly banded with dusky, at least towards the base on the outer surface. Legs long and slender, front tibiæ at least twice as long as the pronotum, and longer than the femora; middle tibiæ hardly longer than the femora; hind tibiæ considerably longer. Ovipositor two-thirds as long as the body, slightly curved.

Long. corporis	..	..	..	14-16 mm
„ pronoti	..	..	..	5-6 „
„ femorum anticorum	..	..	..	13-14 „
„ „ posticorum	..	..	..	18-21 „
„ tibiæ posticarum	..	..	..	22-25 „
„ ovipositis	..	..	..	9-10 „

Differs from *D. unicolor*, Brunn., which is in the British Museum collection from Tsur Island, and which is recorded from Vladivostok, Pekin and Moulmein, by its much longer legs, and in the tibiæ being distinctly longer than the femora.

Dr. Annandale has submitted nine specimens to me, all females. As the bodies are considerably arched, the dimensions are probably somewhat understated.

*Locality*.—Limestone caves in hills near Biserat, Jalor, Siamese Malay States (*Annandale and Robinson*).



VIII.—DESCRIPTIONS OF NEW SPECIES OF  
MARINE AND FRESHWATER SHELLS  
IN THE COLLECTION OF THE  
INDIAN MUSEUM, CALCUTTA.

By H. B. PRESTON, F.Z.S.

*Bittium insulsum*, sp. nov.

Shell elongately fusiform, narrowly perforate, yellowish white with a broad circular band of pale reddish brown; whorls 9, cancellate with transverse ribs and spiral grooves; aperture oval; peristome simple.

Altitude .. .. 3 mm.

Diam., major .. .. I „

Habitat—Galle, Ceylon.

Type in Indian Museum, Calcutta.

*Gottonia andamania*, sp. nov.

Shell conical, very solid, white, strongly keeled at periphery; whorls 5, rather flat, spirally lirate and transversely costate, presenting a somewhat minutely nodilous appearance; sutures impressed, aperture circular; peristome thickened.

Altitude .. .. 2 mm.

Diam., major .. .. I „

Habitat—Andaman Islands.

Type in Indian Museum, Calcutta.

*Bithynia pygmæa*, sp. nov.

Shell ovately fusiform, dark olive-brown; whorls  $3\frac{1}{2}$ , convex, smooth; sutures well impressed; aperture oval; peristome simple, continuous; umbilicus narrow; operculum shelly, spiral with central nucleus.

Altitude .. .. 3.25 mm.

Diam., major .. .. 2 „

Aperture, alt. .. .. 1.75 „

„ diam. .. .. I „

Habitat—Myetmyo, Burma.

Type in Indian Museum, Calcutta.

*Odostomia pfeifferi*, sp. nov.

Shell fusiform, semi-transparent white; whorls 6, spirally striate; sutures well impressed; aperture elongately, inversely auriform; columella bearing a coarse plait; peristome simple.

Altitude .. .. 1.5 mm.  
 Diam., major .. .. .5 „  
 Habitat—Andaman Islands.

Type in Indian Museum, Calcutta.



FIG. 1.



FIG. 2.



FIG. 3.

FIG. 1.—*Bittium insulsum*, sp. nov.

FIG. 2.—*Gottonia andamanica*, sp. nov.

FIG. 3.—*Bithynia pygmæa*, sp. nov.

*Miralda gemma*, sp. nov.

Shell oblong ovate, white; whorls 4, somewhat inflated, sculptured on the upper part with coarse costæ, below which appears a spiral liration; lower half of body whorl and base of shell spirally lirate; sutures well impressed; aperture ovate; peristome simple above, somewhat dilated at base.

Altitude .. .. 1.25 mm.  
 Diam., major .. .. .5 „  
 Habitat—Oman.

Type in Indian Museum, Calcutta.

*Limnæa simulans*, sp. nov.

Shell fusiform, brownish horn colour; whorls 5; sutures impressed; umbilicus narrow, partly concealed by the reflexed columella; columella arched, thick, extending into a callus which reaches the lip above; peristome simple; aperture inversely auriform.

Altitude .. .. 7.75 mm.  
 Diam., major .. .. 4.25 „  
 Aperture, alt. .. .. 4 „  
 „ diam. .. .. 2 „  
 Habitat—Pharping, Nepal.

Though the shell itself is of a brownish horn colour, all the specimens before me are covered with a thick blackish coating of some substance, probably of a vegetable nature.

Type in Indian Museum, Calcutta.



FIG. 4.



FIG. 5.



FIG. 6.

FIG. 4.—*Odostomia pfeifferi*, sp. nov.

FIG. 5.—*Miralda gemma*, sp. nov.

FIG. 6.—*Limnæa simulans*, sp. nov.

*Unio siliguriensis*, sp. nov.

Shell inequilateral, ovate oblong, reddish brown, sculptured with concentric lines of growth and oblique transverse wrinkles, these latter being especially marked posteriorly; anterior side rounded; posterior side acuminate rounded; dorsal margin arched; ventral margin very slightly contracted in the middle; umboes much eroded; interior of shell iridescent, pale bluish white.

Long. . . . . 21 mm.

Lat. . . . . 37° 75'

Habitat—Siliguri, N. Bengal.

Type in Indian Museum, Calcutta.

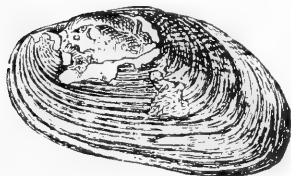


FIG. 7.



FIG. 8.

FIG. 7.—*Unio siliguriensis*, Preston (type), sp. nov.

FIG. 8.—*Corbicula sylhetica*, Preston, sp. nov.

*Corbicula sylhetica*, sp. nov.

Shell nearly equilateral, tumid, subtrigonal, pale olive-green, sculptured with fine irregular concentric striae; anterior side rounded;

posterior side somewhat angularly rounded ; lateral margins sloped ; ventral margin rounded, slightly contracted towards the posterior side ; umboes large ; interior of shell purplish white.

Long.                    ..                    .. 10.5 mm.

Lat.                    ..                    .. 12    ,,

Habitat—Phenchooganj, Sylhet, Assam.

Allied to *C. irawadica*, Benson, but is more trigonal and more swollen.

Type in Indian Museum, Calcutta.



IX.—NOTES ON ORIENTAL SYRPHIDÆ  
WITH DESCRIPTIONS OF  
NEW SPECIES.

PART I.

By F. BRUNETTI.

(N.B.—The plates herein referred to, are to be found in vol. i of the  
Rec. Ind. Mus.,<sup>1</sup> following p. 380.)

Since Van der Wulp's Catalogue of 1896, little work has been done on Oriental *Syrphidæ*. So far as I am aware, less than twenty new species have been described and no paper of importance published. The following notes, collected during a revision of the Indian Museum collection of *Syrphidæ*, may prove of interest. The recently recorded species are referred to and descriptions of thirty-nine new species added, the types of which exist either in the Museum collection or my own.

A number of species named by Bigot, but apparently not described, are in the Museum collection, and these I have described herein.

The tables of species are drawn up partially from descriptions, to serve as aids to their identification *pro tem.*, pending a more thorough revision of this family, and are therefore not intended to represent an ultimate view of their characters and affinities. Mr. Verrall's sequence of sub-families has been followed, but the genera are not arranged in any special order. Circumstances permitting, I hope to deal later on with some of the genera not touched upon in this paper. In the explanation of the plates (given in previous volume) belonging to this paper, the terms "anterior" and "posterior" *leg*, would be more correctly replaced by "fore" and "hind" leg respectively; throughout the text the terms "anterior legs" and "posterior legs" are used in their correct sense, to designate the two front pairs or two hind pairs respectively.

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<sup>1</sup> In the explanation of pl. xi on p. 379, opposite "fig. 9," Macquart is given as the author of the species *Volucella nubeculosa*. This is an error; it should be Bigot.

**BACCHA, F.**

Twenty-one species of *Baccha* have been recorded from the East. Mr. Austen's paper on some new species of this genus in the British Museum (Proc. Zool. Soc. Lond., 1893, p. 132) contains descriptions of seven from the Orient, excellently illustrated, and to these I add three more which appear to be new.

**B. robusta**, mihi, sp. nov. (Pl. xi, figs. 3, 4.)

♂ ♀. Lower Burma (Mergui). Long. 10–12 mm.

♂. Front above antennæ triangular, nearly wholly occupied by a shining black triangle; the remainder grey; vertex shining black; below antennæ dull black, seen from below, but brilliant, shining, silvery white seen from above. Eyes subcontiguous at nearest point of approach, rather widely separated at vertex. Antennæ bright red, tip of 3rd joint brown above.

*Thorax*: dorsum cinereous, with three darker stripes, of which only the centre one attains the fore border. Humeral calli testaceous; sides of thorax grey. Scutellum dull testaceous.

*Abdomen* only slightly contracted at base; 2nd and 3rd segments pale tawny, posterior borders widely blackish, 4th segment all black, with an arched band near base, of pale shining grey, interrupted in the middle; extreme posterior border of segment brown.

*Legs* black; four anterior femora, basal half of hind femora, and basal half of all the tibiæ, yellowish tawny; tips of anterior femora sometimes darkened above.

*Wings* clear; stigma yellow, halteres yellowish.

♀. Front rather broad, grey, the callosity above antennæ shining black, oblong, nearly reaching from eye to eye; upper part of frons shining black, reaching from vertex nearly to the callosity. Abdomen black; 2nd segment with a vertically elongated pale spot on each side, nearly meeting in the centre on the fore-border; 3rd and 4th with a transverse hoary yellowish grey oval spot on each side, nearly on the fore border; 4th segment with brown posterior border; last segment brown.

Described from six ♂♂ and four ♀♀ in the Indian Museum collection from Mergui.

**B. nigricosta**, mihi, sp. nov. (Pl. xi, fig. 5.)

♂. Lower Himalayas (Bhim Tal, 4,500 feet). Long. 10 mm.

Front above and below antennæ grey dusted. Eyes quite contiguous nearly to the vertex, which is very small and shining black. Below antennæ a wide shining black stripe; frontal triangle above antennæ shining black seen from the front. Antennæ reddish brown, the two basal joints black. Proboscis black, tip red.

*Thorax* shining black, minutely pubescent, unmarked, sides blackish grey; scutellum rather large, shining black, with a few pale hairs.

*Abdomen*: 1st segment broadly semi-circular, of exactly the same shape and size as scutellum, 2nd very pedicellate, 3rd narrow at base, thence sharply widening; general colour of abdomen black, moderately shining, with rather long blackish grey hairs at sides of 2nd and 3rd segments, and faint traces of a pair of spots at the middle of the sides of 3rd segment, and towards the base (at the sides) of 4th segment.

*Legs* pale tawny, hind femora and tibiae with a dark band towards the tip, hind tarsi blackish.

*Wings* blackish, nearly clear at base. Stigma black, much elongated and a blackish cloud immediately below it, and a small blackish spot at extreme tip of costa.

Described from one ♂ taken by Dr. Annandale (19-22-ix-06) at Bhim Tal<sup>1</sup>, Kumaon, now in the Indian Museum collection.

***B. tinctipennis*, mihi, sp. nov.** (Pl. xi, fig. 6.)

♀. Lower Himalayas (Bhim Tal, 4,500 feet). Long. 8-9 mm.

*Head*: front broad, narrowing towards vertex, grey dusted, nearly wholly occupied above antennae by a broad black band with ill-defined edges; filling the whole vertex, and resolving itself into a shining black callosity above antennae. Under side of face grey dusted, with a black central line, slightly prominent; mouth-border and proboscis tawny; antennae tawny.

*Thorax* shining black with minute grey pubescence; humeri and a vertical short stripe just before base of wing, pale; scutellum shining black, immediately above the pronotum, giving the appearance of two scutelli, one above the other.

*Abdomen* brown, 1st segment wholly pale yellow; extreme tip of 2nd, base of 3rd and 4th, and two very small spots on the sides at the base of 5th, pale yellow-brown.

*Legs* pale yellow, a brown ring at tip of hind femora; hind tibiae brown, except base and tips; hind tarsi darker.

*Wings* clear, iridescent, a dark brown oblong spot forming a stigma, and a dark spot at tip of subcostal cell, also at tip of wing, the discal cross-vein, and a streak from just below the mediasutinal vein down to and enclosing the lower cross-vein blackish.

Described from one ♀ taken by Dr. Annandale (22-27-ix-06) at Bhim Tal, Kumaon, now in the Indian Museum collection. Some specimens taken by me at Kobe in Japan, 15-v-06, which I consider to be the same species, differ only in the 1st abdominal segment being all black instead of yellow.

I also took at Darjiling and Lucknow respectively a specimen each of what may be two additional new species.

Of *B. dispar*, Wlk., a ♀ named by Bigot is in the Indian Museum collection—this being the only other Oriental species I have seen. Van der Wulp added in 1898 (Termés. Füzet., xxi, 423) two species from Papua new to his list; these were *rubella* and *mundula*.

**PARAGUS**, Latr.**P. luteus**, mihi, sp. nov. (Pl. xi, fig. 1.)

♀. Persia (Bushire). Long. 5 mm.

*Head* pale yellowish white, vertex black, with a thin stripe (slightly enlarged in the middle) leading to a large black roughly-square shining spot above antennæ. Antennæ brown, base paler. Frons gradually narrowed towards vertex.

*Thorax* wholly shining ænous, a whitish hairy stripe, commencing in front of the insertion of the wings, and reaching downwards; scutellum yellow, base black.

*Abdomen* yellow, basal segment black, and a thin black line almost (but not absolutely) on the border of 2nd segment, a similar line just below centre of 3rd segment, and a black mark on each side at the edge of the 4th segment.

*Legs* all yellow, a brown ring towards tip of hind femora.

*Wings* absolutely clear, no stigma.

Described from the above type in the Indian Museum collection.

**P. serratus**, F.

A common species variable both in size, and coloration of the abdomen. The species is the only one with serrated scutellum, and the specimens in the Indian Museum collection, added to those of my own collecting, show a distribution from Calcutta to Nepal and reaching as far west as Karachi and as far south as Bangalore.

**PIPIZELLA**, Rond.**P. indica**, mihi, sp. nov.

♂ ♀. Lower Himalayas (Simla and Nepal). Long. 5 mm.

*Head* yellow; vertex, eyes, mouth and proboscis black. A black central line on the frons in the ♀, which slightly narrows on the vertex; just below the antennæ it is hardly one-third the width of the head.

*Thorax* smooth, shining black, with a little gold-brown hair on the posterior half, and a little white hair on the lower anterior portion of the sides.

*Abdomen* shining black, minutely pubescent, especially on last segment, and distinctly so along the sides of all the segments.

*Legs* tawny yellow, basal half of the four anterior, and basal three-fourths of the hind femora black; tibiæ yellowish white towards the base.

*Wings* clear, stigma very pale yellow; halteres yellow.

Described from a ♂ and two ♀ ♀ in the Indian Museum collection from the Simla district and from Katmandu in Nepal.

The genus has not previously been recorded from the East. This species does not agree with any European one known to me,

but there are two of which I have not been able to obtain descriptions, viz., *P. curvinervis*, Str., and *P. sculpeonata*, Rond.

***P. rufocincta*, mihi, sp. nov.**

♂. Burma (type) and India. Long. 6 mm.

Face yellowish white with a narrow black line below antennæ, which are blackish brown; mouth and proboscis black; vertex shining black, narrowing rather suddenly to the eyes, which are contiguous for only a very short distance.

*Thorax* black, shining, with a slight ænous tinge; a few white hairs on the sides, in front of insertion of wings; dorsum with short greyish hair; scutellum unicolorous with grey hair.

*Abdomen* shining black, with very short pale pubescence, the whole 3rd segment reddish testaceous, and, in the type-specimen, extreme tip of abdomen reddish.

*Legs* yellowish white; coxæ, a narrow ring at base of four anterior femora, and the basal two-thirds of hind femora black.

*Wings* quite clear.

Described from two ♂♂ taken by me at Rangoon, 23-xii-04 to 3-i-05 (type), and from one ♂ taken by me at Umballa (N.-W. India; altitude 900 feet), 8-13-v-05. In my collection. Most species of *Pipizella* have unmarked abdomens, but this species is certainly of this genus, and apparently widely distributed.

**MELANOSTOMA, Sch.**

Dr. Annandale took specimens of *M. ambiguum*, Fln., and *M. dubium*, Zett., at Matiana (8,000 feet; Simla district), both species being European ones and unrecorded previously from the East.

**PLATYCHIRUS, St. Farg.**

Four males of *P. albimanus*, F., are in the Indian Museum collection from the Simla hills (8,000 feet); taken by Dr. Annandale between 27-iv-07 and 3-v-07. These differ in no way from European specimens.

**SPHÆROPHORIA, St. Farg.**

The Oriental species in this genus will require careful revision and comparison with European forms, allied to which the Indian Museum possesses several species; I have a fair amount of material of my own collecting, showing considerable variation of forms, from India, the Himalayas and South China.

Herr Kertész, in the Termés. Füzet. (1899), xxii, 177 and 178, describes two species from Papua new to Van der Wulp's list; *distinctus* and *novæ-guinææ*.

**DIDEOIDES**, mihi, gen. nov.

Allied to *Didea*, Macq., from which it is separated by two characters, *viz.*, (1) distinctly and closely pubescent eyes, and (2) by the 3rd longitudinal vein (cubital, Verrall) being nearly straight, as in *Syrphus*, and not dipped, *Eristalis*-like, into the cell below. In all other respects it resembles *Didea*, Macq., having a bare arista and the large flat ovate abdomen in both sexes much wider than the thorax, and bearing the distinct, ridged margin as in that genus.

**D. ovata**, mihi, sp. nov.

♂ ♀. Sikkim. Long. 12–16 mm.

*Head*, ♂ : face moderately produced above the mouth and just below the antennæ; in depth descending only a little below the eyes. Face and frons bright yellow, with moderately thick yellow hair, which above the antennæ is replaced by black hairs. Eyes touching for half the distance from the top of the frons to the triangular elongated vertex, which is black with black hairs and prominent reddish ocelli. Eyes with close grey pubescence. Antennæ reddish brown, situated on a tawny (darker on upper side) protuberance; 3rd joint of antennæ darker on upper side, arista orange, bare. Mouth and proboscis black, latter with some grey hair at tip. Back of head greenish grey; posterior orbit of eyes with a thick fringe of short bright yellow hair, of equal length all round.

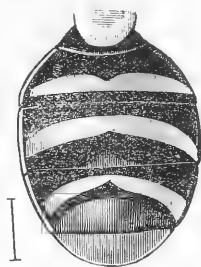
In the ♀ the frons bears a broad greenish black stripe from the vertex down to and enclosing the upper part of the antennal protuberance, the black hairs being thicker than in the ♂. The antennæ are nearly all black except the under side of the first two joints, and the under side of the 3rd at the base; the arista is more brownish than in the ♂, the pubescence of the eyes almost yellowish, especially on the lower part; but the rest of the characters are as in the other sex.

*Thorax*: dorsum dull greenish ænous with three central, narrow, well-separated, not very distinct brownish lines reaching from the anterior nearly to the posterior margin. Sides concolorous, rather darker behind; with a broad yellow vertical stripe just in front of the wing, descending to and terminating on, the meta-pleuræ, this stripe bearing a rather thick fringe of bright yellow hair. In the ♀ all the pleuræ are dull greenish yellow, and the hair is rather more abundant. The dorsum is covered with soft short yellow hair, which around the wing-insertion is bright orange. Scutellum rather dull orange-yellow, covered with soft black hairs; an orange elongated callosity on each side in front with bright orange-brown hair, forming posterior corners to the dorsal surface of the thorax. Metanotum black.

*Abdomen* black, with an unbroken, deep brown raised edge around the entire dorsal surface, closely beset with very short bristles: 1st segment greenish black, sub-metallic, very short; 2nd segment aënous at base, with two orange elongated spots, placed transversely, forming a band, interrupted in the centre; this band being enlarged at the ends (foreshortened in front) in the ♂, and contracted at the ends and barely attaining the ridged edges of the segment in the ♀. A bunch of yellow hairs on the shoulders of this segment in both sexes.



*Dideoides ovata*, mihi, sp. nov., ♂.



*Dideoides ovata*, mihi, sp. nov., ♀.

The 3rd segment bears a transverse orange band across the centre, the anterior edge being slightly convex forward, the posterior edge forming two straight lines narrowing the band in its centre and leaving the remainder of the segment as a flattened black triangle, the extreme posterior edge being sub-metallic dark brown with a fringe of very short black hairs. The sides of this orange cross-band are parallel with the sides of the abdomen, to the ridges of which they extend.

On the 4th segment is a similar, but rather narrower and slightly more arched band, with a second orange band (as a flattened triangle, sub-metallic posteriorly) on the posterior part of the segment, the extreme edge of which is sub-metallic brassy, with a fringe of longish yellowish hair. The ♀ shows no trace of the sub-metallic tinge. The 5th segment is orange, with black at the base in some specimens of ♂♂; yellow haired. The whole abdomen bears yellow hairs on the yellowish parts (longest towards the tip), and shorter, black hairs on the black parts. Genitals: in the ♂ rather prominent, orange, with some short black hairs; in the ♀ small, elongated, dark coloured.

Belly in the ♂ black with narrow yellowish bands at the juncture of the segments, widest on the posterior border of the 2nd. In the ♀ black, with two semi-circular large yellow spots at the base of the 2nd, 3rd and 4th segments; the posterior border of the 1st, widely, of the 3rd, narrowly, and of the 2nd, very narrowly (with enlargements at the corners) yellow. Belly nearly bare, a little short yellow sparse hair.

*Legs*: coxæ and base of femora black with some short black hair; remainder of legs entirely orange-yellow, the upper sides

of the tarsi being a little browner. The anterior femora bear a little pale hair on their under side, but the black hairs on the hind pair extend almost to the tip below, the upper apical part being bare. All the tibiæ bear very short golden yellow pubescence the hind pair having a row of short black bristles on the outer side.

*Wings* pale yellowish grey, slightly tawny on the basal and anterior parts. Halteres orange. Tegulæ bright orange-yellow with concolorous fringe.

Described from four ♂♂ and two ♀♀ (one, a melanic ♀ described below) all from Sikkim and in the Indian Museum collection in good condition.

One specimen (a melanic ♀) has the antennæ almost entirely black (another characteristic of *Didea*), the abdomen black with a dark blue sub-metallic reflection, beset with short black hairs, the only marks being a transverse band across the centre of the 2nd segment, composed of two narrow straight oblong spots, extending to the distinct ridged edge which runs round the entire abdomen; some yellow hair on the 2nd segment. Belly black, but with the two pale yellow spots at the base of the 2nd, 3rd and 4th segment exactly resembling those in the typical form; posterior edge of segments narrowly yellow, showing a tendency to spread at the sides on the 2nd segment.

*N.B.*—I had some hesitation before deciding to establish a new genus for the reception of this well-marked species, but probably if I had not done so, some other author would. It appears to be intermediate between *Didea* and *Syrphus*, having the broad ovate and ridged abdomen of the former genus, but differing in the straight 3rd longitudinal vein and pubescent eyes.

The pubescence of the eyes, and the dip of the 3rd longitudinal vein are neither of them conclusive characters, and as *Syrphus* contains species some with bare and others with hairy eyes, and also species with straight and dipped cubital veins, I think *Didea* might well do the same, and I would have kept the species in that genus, except for the reason given above.

### ERIOZONA.

**E. ruficauda**, mihi, sp. nov. (Pl. xi, fig. 2.)

♀. Sikkim. Long. 13 mm.

Face prominent, bright yellow, shining, with minute yellow pubescence, smooth; cheeks and lower part of face black with very inconspicuous black hairs. Front above antennæ to vertex blackish with black hairs, with a pale irregularly-shaped yellow spot immediately over the antennæ, which are black. Eyes pubescent, wide apart, frontal space gradually widening from vertex to cheeks.

*Thorax* quadrate, blackish above, sides dark brown with brownish yellow hairs, hair on dorsum less thick; scutellum brown with yellowish hairs.



*Abdomen* with thick black hair on basal half, 4th and 5th segments with thick orange-red hair, and with a small dark triangle in the middle of the posterior border of each; the 2nd segment has traces of a lighter basal band, somewhat resembling that of *Leucozona lucorum*. Belly pubescent, basal half black, apical half red.

*Legs* tawny, basal half of all femora blackish.

*Wings* pale grey, a broad brown band in the middle, narrowing posteriorly from foreborder up to just across the base of the discal cell; base of wing brown.

Described from three ♂ ♀ from Sikkim in the Indian Museum collection.

*N.B.*—This genus has only recently been known from the East. In 1901 Herr Kertész described a species, *analís*, which also came from Sikkim (Termés. Füzet., xxiv, 414).

### SYRPHUS, F.

This genus I dare not touch upon at present in view of the large number of supposed species described from Oriental regions, and their close affinities.

I have seen several species from the hills that are common in Europe, the specimens showing generally little or no difference; amongst them are *balteatus*, DeGeer; *torvus*, Os. Sac.; *pyrastri*, L.; *luniger*, Mg.; and *umbellatarum*, F.; all taken by Dr. Annandale in the Simla district, and all, except *balteatus*, are new to the Oriental fauna.

### RHINGIA, Scop.

Until quite recently (1904) this genus appears to have been unrecorded from the East, but in that year Meijere described a new species, *cincta*, from Java, whilst I have taken a new species occurring in Mussoorie and Darjiling, and also a second one, represented by a single ♂ from Darjiling; moreover the Indian Museum collection supplies a third undescribed species from Darjiling and Simla. Meijere's species, therefore, is still the only one from a tropical locality. The two common European species, *rostrata*, L., and *campes-tris*, Mg., are both likely to occur in the north of India. The former would be easily recognised from all the other species by its ash-blue-grey thorax (the others being cinereous grey or æneous); and the latter can be distinguished from *cincta* and *binotata* by its tawny instead of mainly blackish abdomen.

#### *Table of Oriental species of Rhingia.*

Scutellum distinctly bright ferruginous tawny.

Abdomen with three or four pale bands.

Long. 9 mm. *cincta*, Meij.

Abdomen black, 2nd segment with two

lateral spots . . . Long. 9 mm. *binotata*, mihi, sp. nov.

Scutellum cinereous grey.

Posterior border of abdominal segments

widely black . . . Long. 7-9 mm. *laticincta*, mihi, sp. nov.

Posterior border of abdominal segments

very narrowly black. Long. 8 mm. *angusticincta*, mihi, sp. nov.

**R. laticincta**, mihi, sp. nov. (Pl. xi, fig. 7.)

♂ ♀. Mussoorie, Darjiling, 7,000 to 12,000 feet. Long. 7 to 9 mm. (without snout).

*Head*: snout tawny; lower part of head shining grey; antennæ tawny; eyes quite contiguous as far as the vertex; frons in ♀ of about the usual width in the genus, cinereous grey.

*Thorax* cinereous grey, with ænous reflections and soft black-and-grey hair; four blackish longitudinal stripes, not always very distinct, the two outer ones interrupted at the suture, the two inner ones close together on the front, diverging widely posteriorly, where they become diffused and meet the ends of the outer pair just in front of the scutellum. Scutellum unicolorous, similarly haired, a row of stiff black hairs on posterior edge, from which a fringe of soft pale yellow hair hangs down.

*Abdomen* bright tawny, with soft yellow hair, thickest at the base on the sides; 1st segment very narrowly black edged, 2nd, 3rd and 4th with a broad black band on posterior border, interrupted in the centre in front, but continuous on the extreme edge of segment; a vertical long black spot on the dorsum of each segment forms a sort of longitudinal dorsal stripe. Belly tawny brown.

*Legs* all pale tawny, all the femora black at the base, and an indistinct blackish wide ring around the centre of the hind tibiæ; feet darker. In the ♀ the femora are nearly all pale and the ring on the hind tibiæ is less distinct.

*Wings* pale grey, stigma yellowish.

Described from a ♂ (Darjiling) and ♀ (Mussoorie) in the Indian Museum collection (types), and a ♂ and ♀ in my own collection.

**Var. fasciata**, ♂ ♀. (Pl. xi, fig. 8.)

What I take to be a variety of *laticincta* differs by the abdominal bands being reduced to semi-circular spots placed on the posterior borders of the segments and joined by a very narrow line on the extreme edge. The legs in the ♂ are paler, and show only very slight traces of black at the base of the femora; in the ♀ they are wholly pale, almost livid, with only the faintest indication of a dark band on the hind tibiæ. Another point of difference is that the pubescence on the thorax is much shorter, and almost absent on the posterior part, and the scutellum is practically bare, except for some long hairs towards the tip.

I have four specimens (♂ ♂ ♀ ♀) taken by myself at Darjiling (7,000 feet), 10-15-X-05, and am not at all sure that it is not specifically distinct, for which reason I have given it a name. In my collection.

**R. angusticincta**, mihi, sp. nov.

♂ ♀. Darjiling and Simla, 8,000 to 12,000 feet. Long. 8 mm. (without snout).

This species resembles *laticincta*; the points of difference being as follows: the snout is distinctly shorter; the abdominal transverse bands are extremely narrow, and not interrupted, this being the main, but a consistent, difference.

Described from a ♂ and ♀ taken by Dr. Annandale at Simla and Theog (Simla district) respectively. The Indian Museum possesses these types, also what is apparently an additional ♂ from Darjiling (9,000 to 12,000 feet), 2-x-06, but in this specimen the thorax is darker, and all the tibiæ have a distinct broad black ring.

**R. binotata**, mihi, sp. nov.

♂. Darjiling. Long. 9 mm.

*Head*: frons and upper part of snout deep black; lower part of both face and snout tawny yellow. Antennæ brownish red. Vertex very small, with a few black hairs; short yellow hairs behind the head above, and rather close whitish hair on lower part; proboscis black.

*Thorax* yellowish grey, with four rather indistinct dorsal, slightly darker stripes; the two outer ones wide, and interrupted at the suture; the two inner ones very narrow and close together. The dorsum with rather thick, short bright yellow hair; sides of thorax cinereous grey, darker posteriorly, some yellow hair just below wings; scutellum bright tawny, dorsum bare, a fringe of short yellow hairs at base, and a fringe dependent from posterior margin, on which margin is set another fringe of long yellow hairs, projected posteriorly, by which character this species differs from all the others.

*Abdomen* æneous black, covered with thick, short, bright yellow hair; the 1st segment appears pale, and on the 2nd on each side, towards the base, is a lateral, oval, pale yellow spot.

*Legs* orange-yellow, basal half of all femora black; the femora with soft yellow hair, the rest of the legs practically bare.

*Wings* yellowish grey, slightly darker in front; stigma pale yellowish brown; halteres yellowish brown.

Described from one ♂ in perfect condition, captured by me at Darjiling, 13-x-05. In my collection.

The three species, herein described as new, are quite distinct and good species, and quite different from the two European species, *rostrata* and *campestris*, and from Herr Meijere's species *cincta* from Java.

**VOLUCELLA**, Geoff.

To this handsome genus I introduce four new species, whilst Meijere has added one from Darjiling to the five in Van der Wulp's

catalogue. The following table is made up partly from descriptions, as, beyond my own species, the only one before me is a headless specimen of what I have identified as *nubeculosa*, Big. (see pl. xi, figs. 9, 10).

*Table of Oriental species of Volucella.*

- Quite small species . . . Long. 7 mm. *opalina*, Wied.  
 Larger species. Long. 13 to 16 mm.  
 Non-pubescent (not *Bombus*-like) species.  
 Thorax and abdomen only slightly  
 and shortly hairy.  
 Abdomen yellow, with two spots and  
 tip black . . . Long. 13 mm. *trifasciata*, Wied.  
 Abdomen black; marked or not.  
 Thorax bright tawny.  
 Abdomen with two narrow  
 pale cross-bands; wing  
 suffused in centre and at  
 tip . . . Long. 16 mm. *nubeculosa*, Big.  
 Abdomen entirely black;  
 wings pale brown, un-  
 marked. . . Long. 16 mm. *discolor*, mihi, sp.  
 nov.  
 Thorax black.  
 Abdomen with only one  
 transverse narrow basal  
 pale spot. Long. 16 mm. *basalis*, mihi, sp. nov.  
 Abdomen with more than a  
 single spot.  
 Abdomen marks in the  
 form of spots.  
 Long. 13 mm. *peleterii*, Macq.  
 Abdominal marks in the  
 form of three yellow  
 bands. Long. 14 mm. *decorata*, Wlk.  
 Pubescent (*Bombus*-like) species. Thorax  
 and abdomen with long thick hair.  
 Tip of abdomen black haired.  
 Long. 17 mm. *ursina*, Meij.  
 Tip of abdomen yellow or red.  
 Belly uniformly black.  
 Long. 14-15 mm. *ruficauda*, mihi, sp.  
 nov.  
 Belly with 2nd and 3rd  
 segments livid.  
 Long. 15-16 mm. *lividiventris*, mihi, sp.  
 nov.  
 The above species all appear quite well separated.

**V. basalis**, mihi, sp. nov. (Pl. xi, figs. 11, 12.)

♀. Sikkim district (Mungphu). Long. 16 mm.

*Head* entirely bright orange, frons narrows towards vertex, which is black; mouth-border brown; proboscis and extreme lower part of cheeks black; eyes bare. The face is considerably produced into a large snout, which is cut away just below the antennæ; antennæ small, orange.

*Thorax* moderately shining black, bare, sides black; scutellum very dark brown, almost bare, except for a row of strong bristles near posterior edge.

*Abdomen* black, a little shining, almost bare; the basal half of the 2nd segment occupied by a large transverse livid yellow elongated spot, which is contracted in the middle behind and does not reach the sides of the segment except at the extreme base, where it joins a large livid spot on the same segment of the belly.

*Legs* all black and bare.

*Wings* grey, yellow at base, a yellowish brown suffusion from the centre of the costa reaching half way to the posterior border, and a similar suffusion at the wing-tip extending inwards just beyond the subapical and postical cross-veins. Halteres yellow.

Described from one ♀ in the Indian Museum collection.

This species bears a considerable general resemblance to the *V. pellucens*, L., of Europe, but in that species the *whole* of the 2nd segment is livid yellow, the colour passing over the side of the segment in its full width, whereas in *basalis* it is narrowed to the extreme base of the segment; also in *pellucens* the sides of the thorax along their upper edge are always brownish yellow, of which there is no trace in my species; moreover, the scutellum in *pellucens* is bright tawny, whereas in *basalis* it is nearly black.

**V. ruficauda**, mihi, sp. nov. (Pl. xi, fig. 13.)

♂ ♀. Sikkim. Long. 14-15 mm.

*Head* black, epistome well produced, shining black; eyes densely hairy in ♂, distinctly hairy in ♀, but to a much less extent; vertex crowned by a tuft of long bright yellow hairs; eyes in ♀ separated by narrow shining black frons. Antennæ ferruginous; first two joints nearly black.

*Thorax* black with black hair, dorsum covered with dense long bright ferruginous red hair which also covers the bright ferruginous red scutellum.

*Abdomen* black with rather thick black hair; posterior border of 3rd segment and the whole of the 4th and 5th segments covered with yellowish red hair. Belly entirely black, with black hair.

*Legs* slender, wholly black with short black hair.

*Wings* pale yellowish grey, a rather large brown irregular spot in the centre of the fore border, and reaching half-way across the

wing; a brown suffusion along the recurrent portions of the sub-apical and postical (4th and 5th longitudinal) veins and extending to the costa about the termination of the marginal cell. Between this suffusion and the outer margin the wing is darker grey, base of wing slightly yellowish. Halteres black.

Described from eight ♂ ♂ and eight ♀ ♀ in the Indian Museum collection from Sikkim.

**V. lividiventris**, mihi, sp. nov.

♂ ♀. Sikkim. Long. 15–16 mm.

Very near *ruficauda*, but distinct. The hair on the thoracic dorsum is distinctly grey, the tuft of hair on the vertex is greyish white, while the belly has the 2nd and 3rd segments livid grey with unicolorous hair. A bunch of grey hair is found on each of the two basal abdominal segments at the sides, and the sides of the 2nd segment in front have a perceptible subdued livid reflection when seen from behind.

Described from three ♂ ♂ and a ♀ from Sikkim in the Indian Museum collection.

**V. discolor**, mihi, sp. nov.

(*Id. id.*, Bigot, *nom. nud.*)

♂. Assam. Long. 10 mm.

*Head*: eyes not quite contiguous, black, facets small, uniform. Vertex, frons, and entire face bright orange, bare. Face immediately below antennæ flush with the eyes, but from thence projecting well forward, forming a large squarish prominence, not reaching downwards much below the eye-level. Antennæ on a barely perceptible prominence, orange, with orange plumose arista. Back of head and under side orange, a little orange-yellow hair below.

*Thorax* wholly uniformly bright orange, with close short golden yellow hair on dorsum, changing to longer orange hair on the edge, on the posterior part, and on the pleuræ. Scutellum pinkish orange, a little yellow hair round the sides.

*Abdomen*: 1st segment (hardly visible) dark coloured, remainder wholly shining black, with microscopic black pubescence. On each extreme anterior corner is a small bunch of rather short yellow hairs. Belly black, unmarked.

*Legs* wholly bright orange, with short golden yellow hair, which is a little longer on the coxæ. The tarsi very narrowly black between the joints.

*Wings* uniformly pale brown, outer half towards the anterior margin a little darker. Halteres bright orange.

Described from one perfect ♂ from Sibsagar in the Indian Museum collection.

**GRAPTOMYZA**, Wied.

Van der Wulp's reference in his catalogue is incorrect, as the genus was described ten years previously in Wiedemann's *Nova Dipterorum* (1820), and redescribed in his *Auss. Zweifl.*, ii (1830).

Since that catalogue, no new Oriental species have been described. Osten Sacken treats of the genus in the *Berl. Ent. Zeits.*, xxvi, 117, where he gives a table of species.

**G. longirostris**, Wied.

Var. nov. *12-notata*, mihi.

(*Graptomyza 12-notata*, Bigot, *nom. nud.*)

A specimen in the Indian Museum collection seems to be but a variety of *longirostris*, Wied., although presumably the type of Bigot's species *12-notata* (*nom. nud.*). It, however, agrees quite well with both Wiedemann's description and his three figures, except that the longitudinal stripes are interrupted at the juncture of the segments, thus being divided into twelve separate elongated spots placed in four longitudinal rows, the "stripes"



*Graptomyza longirostris*, Wied.



*Graptomyza longirostris*, Wied, var.  
*12-notata*, Big., *nom. nud.*

being simply broader. On the strength of this close resemblance I can only admit it provisionally as a variety. A second specimen in the collection (from Tenasserim) agrees more closely still with Wiedemann's figure of the abdomen, the black longitudinal stripes being narrower, and continuous.

Bigot's second species "*6-notata*" must be near *ventralis*, Wied.; according to Osten Sacken's table, from which it would be separated by the six well-defined sub-triangular spots on the abdomen, which is bordered on each side by a rather wide dark brown line.

**G. sexnotata**, mihi, sp. nov.

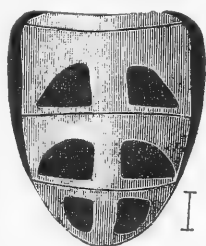
(*Id. id.*, Bigot, *nom. nud.*)

♀. Sikkim. Long.  $7\frac{1}{2}$  mm.

*Head*: frons, vertex, face, entirely yellow, eyes blackish brown, with very short greyish pubescence; frontal space less than one-third the width of the head. Antennæ, entirely uniformly dark yellow, with plumose orange arista. A dark brown square spot on frons above the antennæ is continued as a stripe below to the

end of the rostrum ; a broad brown stripe on each side of the rostrum. Proboscis brown ; palpi, pale yellow. Back of head and below yellow, centre part apparently black.

*Thorax* orange-yellow, the dorsum occupied by a shining black quadrate spot, which leaves only a yellow anterior margin, wider lateral margins and a squarish spot in front of the scutellum. A rather wide dark brown vertical stripe extends from between the fore and middle coxæ, to the lateral yellow edge of the dorsum, thence curving backwards to just above and behind the root of the wing ; a shorter similar stripe is immediately below the wing-insertion, with a roundish brown spot behind it. Dorsum nearly bare, a few yellow hairs on pleuræ ; scutellum yellow, dorsum dark brown, indented ; some yellow hairs round the margin.



*Graptomyza 6-notata*, mihi, sp. nov., ♀.

*Abdomen* orange yellow, with a rather thick moderately broad lateral dark brown margin, narrowing posteriorly and disappearing at tip. On the hind border of the 2nd segment two moderately large, dark brown triangular spots ; reproduced on the 3rd segment, but a little larger, and with rounded angles ; and again on the 4th segment, more triangular and of the same size as those on the 2nd segment, but placed quite clear of the hind border. Dorsum of abdomen practically bare, but with some short yellow hairs towards the tip.

*Legs* yellow, fore coxæ with short pale yellow hairs ; femora with a brown streak below ; tibiæ pale yellowish brown, the hind leg (one leg missing) showing the brown almost as a wide band ; tarsi, yellowish, brownish on upper side. Legs with short yellow hair, a little thicker on the tibiæ.

*Wings* clear yellowish grey, tip of subcostal cell tawny brown, forming a not very well-defined stigma at the tip of the mediastinal vein. Halteres orange-yellow.

Described from one ♀ in fair condition in the Indian Museum collection from Sikkim.

### HELOPHILUS, Meig.

In dealing with this genus, the short descriptions of the species, many of which are very closely allied, have materially hindered satisfactory progress. The following table is made up mainly from descriptions. My material in the genus has been three species in the Indian Museum collection determined by myself,—*bengalensis*



W., *quadrivittatus*, W., and *insignis*, Dol.; plates of *curvigaster*, Mcq., *notabilis*, Mcq., *insignis*, Dol., and *pilipes*, Dol.; two new species in the Indian Museum collection which I have named *aënus* and *tuberculatus*, both very distinct from all others, and descriptions only of the remainder. I think the table may assist as an introduction to the better study of this genus, but I find great difficulty in understanding the true affinities of Walker's species.

*Table of Oriental species of Helophilus.*

- A Face perpendicular, not produced as usual, nor excavated below antennæ, nor gibbous above mouth. Hind tibiæ incrassated .. Long. 11 mm. *celebes*, O.S.
- AA Face distinctly and normally produced (exceptionally so in *notabilis*, Mcq.). Hind tibiæ not incrassated.
- B Thorax with transverse bands of pubescence .. Long. 8 mm. *curvigaster*, Macq.
- BB Thorax with ground colour longitudinal black and yellow stripes.
- C Body ænous Long. 10 mm. *aënus*, mihi, sp. nov.
- CC Body yellow and black, not ænous.
- D Abdomen very elongated.
- E Middle legs not denticulated. Long. 22 mm. *caudatus*, Meij.
- EE Middle legs strongly denticulated.  
Long. 17-25 mm. *tuberculatus*, mihi, sp. nov.
- DD Abdomen of the ordinary oval or ovate shape.
- F Anterior femora and tibiæ with dense yellow hair .. Long. 12 mm. *pilipes*, Dol.
- FF Anterior femora and tibiæ moderately and normally haired.
- G Length 14 to 16 mm.
- H Abdomen with two luteous bands.
- J Shining blue above antennæ. Long. 16 mm. *doleschalli*, mihi.  
(Change of name from *insignis*, Dol.)
- JJ Blackish brown above antennæ.  
Long. 15 mm. *vestitus*, W.
- HH Abdomen with three luteous bands.
- L Side stripe on thorax yellow. Long. 16 mm. *insignis*, Wlk.
- LL No side stripe (presumably). Long. 14 mm. *notabilis*, Macq.
- OO Length 9 to 11 mm. (in *mesoleucus* 13).
- M Sides of thorax with broad oblique yellow stripe.
- N Legs mainly luteous, "shaded with black," wings green .. Long. 10 mm. *conclusus*, Wlk.
- NN Legs mainly black, base of tibiæ pale, wings not green Long. 10-11 mm. *albiceps*, Wulp.

- MM Sides of thorax cinereous or grey ; without  
yellow stripe.
- O Length 13 mm. .. Long. 13 mm. *mesoleucus*, Wlk.
- OO Length 9 to 10 mm.
- P Posterior femora incrassated. Long. 10 mm. *consors*, Wlk.
- PP Posterior femora only ordinarily thickened.
- Q 4th abdominal segment with an inverted  
V-mark Long. 9-10 mm. *bengalensis*, Wied.
- QQ 4th abdominal segment without such  
mark Long. 9-10 mm. *quadrivittatus*, Wied

**H. ænus**, *mihi*, sp. nov. (Pl. xii, fig. 15.)

♀. Nepal (Soondrijal). Long. 10 mm.

*Head* black, face moderately produced, very shining and bare above antennæ, but changing to dull velvet black on vertex with black hair, frontal space narrowing above, ocelli very close together. Face below antennæ, dull black, with, seen from above, silvery grey hair ; a central shining bare black line. Antennæ dark brown. Back of eyes with a thin silvery white line, with unicolorous hair.

*Thoracic dorsum*, ash-blue-grey, with two transverse black bands ; one across the centre, and one on the posterior border. Anterior part of thorax cinereous, with two faint, narrow darker bands in centre, which disappear on reaching the 1st transverse black band ; whole dorsum covered with short bright yellow hair. Sides of thorax light cinereous grey, with some yellow hair. Scutellum blue ash-grey, basal half black ; entirely covered with bright yellow hair.

*Abdomen* ænous, 1st segment paler ; 2nd with a rather broad dead black velvet line on base, joined by a stem to a similar band on the posterior border, which, however, is curved upward a little in the middle, clear of the posterior border ; 3rd segment with a central round spot joined to two moderately broad lines which proceed obliquely almost to the posterior corners ; 4th segment with a nearly similar pattern, the oblique lines joining one another in the centre—without being enlarged into a dorsal spot. All these abdominal marks dull velvet black. The whole upper surface of the abdomen with rather close, short yellow hair. Belly black.

*Legs* : femora black, hind pair more shining, all with yellow hair below ; tibiæ and tarsi tawny yellow, with some yellow hair ; hind pair with apical half black.

*Wings* pale grey, costal cell absolutely clear, stigma brown, small, veins brownish ; halteres and tegulæ pale yellow.

Described from one ♀ in the Indian Museum collection (October).

It reminds one very much of the European species *Eristalis sepulchralis*, L., and, more so, of the North American species *dimidiata*, Wied., and *saxorum*, Wied., but is distinctly smaller.

**H. tuberculatus**, mihi, sp. nov. (Pl. xii, figs. 16, 17.)

♂ ♀. Calcutta. Long. 19–25 mm.

*Head*: epistome normally produced. Front black, shining just above antennæ, dull in the ♀ from thence to vertex. Eyes contiguous (♀) at base of supra-antennal triangle, diverging gently to the vertex. Front in ♀ moderately wide, narrower above; face below antennæ blackish or reddish, with grey or yellow hair, antennæ ferruginous brown to black; 3rd joint sometimes quite greyish; first two joints with a few black hairs. Front, vertex, and back of head with short, stiff, all-black hair.

*Thorax* rather elongated; yellowish, with three broad black long stripes of equal width (third abbreviated behind) placed close together, so that the yellow intermediate space is very narrow; dorsum covered with short yellow hair. Humeral calli brown, with yellowish hair; posterior calli oval, distinct, shining. Sides of thorax blackish grey with mixed tufts of brown, white and yellow hair; scutellum yellow with yellow hair.

*Abdomen quite elongated*, resembling that of a *Milesia*; in the ♂ the 1st segment very short, yellow; 2nd tawny, with a thin basal black line produced downwards across the disc to a rather wide, very indistinct blackish band towards posterior border; 3rd segment, basal half tawny, apical half brown; 4th segment similar, but only basal fourth yellowish; 5th segment uniformly rich brown. In the ♀ the transverse bands across the hind parts of the segments are black instead of brown.

In the ♂ the first three segments are covered with soft yellow hair, much thicker on 2nd segment; this hair appears to be sparser in the ♀.

*Legs* all black, knees of four anterior legs tawny; *all the femora much thickened in the ♂*, but *only the posterior pair moderately so in the ♀*. In the ♂, the hind femora bear a distinct tooth in the centre of the under side, and an erect fringe of bright yellow hair on upper side for three-fourths of the length from the base, the remaining fourth bearing black hair. The middle femora bear a transverse ridge below near the tip, followed by a small blunt tooth; the middle tibiæ are suddenly incrassated before the middle, and bear two pairs of blunt teeth at the base.

All the legs with short black pubescence, longest on femora and posterior tibiæ.

*Wings* brownish grey; apical half, anteriorly, darker.

Described from two ♂♂ and three ♀♀ from Calcutta in the Indian Museum. A remarkable species, and one which, from the elongated, almost cylindrical abdomen, and denticulated middle legs in the ♂, will no doubt require the erection of a new genus for its reception. I, however, refrain from doing this prematurely; in all other respects it agrees with *Helophilus*. Moreover, it must be closely allied to a recently described species by Meijere, from the Aru Islands (*H. caudatus*), from which, however, the denticulation of the middle tibiæ at once distinguishes it.

**H. celeber**, O. S.**H. curvigaster**, Macq.**H. aënus**, mihi, sp. nov.

These three are quite distinct from all the other species, and may be instantly recognised respectively by the perpendicular face and incrassated hind tibiæ in *celeber*; the transverse bands of pubescence on the thoracic dorsum in *curvigaster*; and the wholly aënous and *Eristalis*-like appearance of my new species.

**H. caudatus**, Meij.**H. tuberculatus**, mihi, sp. nov.

These two species stand out from all others by their elongated abdomens, my new species being easily differentiated from Meijere's by the presence of the strong denticulation of the middle tibiæ, a feature which he does not mention as being present in his specimen; the latter was a ♂, the middle legs of which were, moreover, not missing, as he describes their coloration.

**H. pilipes**, Dol.

The author figures his species, and distinctly shows the thick pubescence of the *first* pair of femora and tibiæ, the *middle* pair being nearly bare; so that the specimen in the Indian Museum collection named "*pilipes*, Dol.," by Bigot is erroneously identified.

This specimen (♂) I have figured in pl. xii, figs. 18, 19, 20, a lateral view being given, because the specimen is partly curled up, and also to show the formation of the anal segments. The anterior and middle legs are also shown, the hind pair being missing. It approximates to *insignis*, Dol., but the hairy middle legs separate it; I therefore figure it, so that perhaps some other dipterologist may recognise it. In the Indian Museum collection are a ♂ and ♀ approaching *pilipes*, Dol., but they have *clear* wings and *no yellow hair* on anterior legs. This species (a ♂ from Calcutta) I also figure in pl. xii, figs. 11 and 12.

Doleschall distinctly says his *pilipes* is near the *pendulus*, Meig., of Europe, but smaller.

**H. vestitus**, Wied.**H. doleschalli**, mihi (*nom. nov.* for *insignis*, Dol.). (Pl. xii, figs. 7, 8, 9.)**H. notabilis**, Mcq.**H. insignis**, Wlk.

The specific name *insignis* was employed by Walker and Doleschall for two different species, both in the same year (1857). I venture to change Doleschall's specific name to *doleschalli* and

let Walker's name stand, because the introduction (by Mr. W. W. Saunders) to Walker's paper in the Proceedings of the Linnean Society of London is dated Jan. 14th, 1856, whereas Doleschall's paper is dated March 16th, 1857. I have, however, no means of deciding which was *published* first, both appearing in 1857.

*H. doleschalli* extends from Calcutta to Assam.

***H. conclusus*, Wlk.**

***H. albiceps*, Wulp.**

These two species stand out from the remainder by the broad oblique yellow stripe on the side of the thorax, which is absent in the other four, and the recorded green wings of *conclusus* should easily identify it.

***H. mesoleucus*, Wlk.**

***H. consors*, Wlk.**

***H. bengalensis*, Wied. (Pl. xii, figs. 4, 5, 6.)**

***H. quadrivittatus*, Wied. (Pl. xii, figs. 1, 2, 3.)**

These four species must be closely allied, but a comparison of specimens of the two latter species (which are not uncommon in Calcutta, and are identified by me from Wiedemann's Auss. Zweifl.) with Walker's types of the other two species, may allow me to speak definitely later on.<sup>1</sup> Walker says of *mesoleucus*, "hind femora thick," and of *consors*, "hind femora incrassated, hind tibiæ curved." The femora are always thickened in this genus, and in most cases the hind tibiæ are curved also, although, of course, a case of very distinct incrassation would clearly define a species. As regards *H. bengalensis*, Wied., and *quadrivittatus*, Wied., they are both good and distinct species although extremely closely allied. Of the latter species Wiedemann saw only a single ♂ and expressed doubts as to its being distinct from the former one. His distinctions as to the whiteness of the face and the coloration of the legs I do not find reliable, but the differences of markings on the 4th abdominal segment are quite consistent in both species.

In *bengalensis* the 4th segment has a mark which varies greatly in colour,—yellow, red, brown, and deep black,—but it is always present, is clearly cut, and in the form of an inverted V (or, sometimes, that of a bow) stretched out right across the segment. In *quadrivittatus* this mark is absent, the segment being black with whitish dust at each side, the ground colour showing roughly in the form of a triangle with its apex on the base of the segment. Both species are moderately common in Calcutta and I have examined a good many of both sexes of each, including a long series of *quadrivittatus* from Bangalore, South India, in the

<sup>1</sup> Specimens determined by me as *H. bengalensis*, Wied., have been confirmed as such by Herr. Handlirsch of the Vienna Museum after comparison with the type.

Indian Museum collection, and a good series of *bengalensis* taken in Calcutta.

In pl. xii is a figure (fig. 10) of what I at first thought might be a different species, but now consider only a variety of *bengalensis*. Several specimens from various parts of India and Assam are present in the collection.

In addition to the described species enumerated herein, there is a ♀ specimen (wings missing) in the Indian Museum collection taken on the Second Yarkand Expedition and apparently a different species to any known to me. I therefore figure it in pl. xii, figs. 13 and 14, showing the abdomen and the markings of the legs. The black on the middle femora, however, is at the *base*, and not in the form of a distinct band removed from the base, as it appears in the figure. It may be a variety of some Palæarctic species. The last figure (pl. xii, fig. 21) is of a Calcutta specimen, which may be a variety of *bengalensis*, or may be distinct.

### ERISTALIS, Latr.

I do not propose to deal with this genus in the present paper to any extent, its intricacies being far too extensive, considering the limited amount of material at my disposal. Two species were omitted by accident from Van der Wulp's Oriental Catalogue; these are—

**E. tortuosus**, Wlk., 1861, Proc. Linn. Soc. Lond., v, 266; Tond.

**E. (Eristalomyia) sapphirina**, Big., 1880, Ann. Soc. Ent. Fr. (v), x, 230; Papua.

One non-Oriental species crept into the catalogue by error; this is *E. semicirculus*, Wlk., the habitat of which is Honduras.

### **E. ursinus**, Big.

I propose to change this name to *himalayensis*, as the species is found at Mussoorie, Sikkim, Darjiling, Simla, and several localities in Nepal.

Bigot's species (of which the type is in the Indian Museum collection) was described by him in the Ann. Soc. Ent. Fr. (1880) (5), x, 215 from "Hindustan," but the name was preoccupied by Jænnicke in 1868 in "Neue exot. Dipt.," 93, for a very different species, from Java. The present is a furry species, belonging to the *intricarius* group, and to which Wiedemann's *orientalis* also belongs. Of the latter species the Indian Museum possesses a short series of both sexes from Sikkim.

*N.B.*—Amongst some unnamed species of *Eristalis* in the Indian Museum collection is a ♀ from Sikkim closely resembling *intricarius*, L., but with the face much more produced, the hair on the major part (apical) of the abdomen bright red, the legs wholly black, and the arista plumose nearly to the tip. The produced face makes it appear specifically distinct.

**E. tenax, L.**

This nearly cosmopolitan species, including the variety *campestris*, Mg., appears quite widely distributed in the Palæarctic districts of the east, as it comes from every station in the Himalayan hills. I have taken it myself at Mussoorie and Darjiling, also from localities further east (Hongkong, Shanghai, and in Japan); yet I have seen only a very few specimens from the Indian plains (Bareilly, Meerut) and none at all from any more tropical locality.

**E. solitus, Wlk.**

My identification of this species is corroborated by Mr. Austen, who has kindly compared specimens with the type in the British Museum. A considerable series in the Indian Museum collection shows specimens from Sikkim, Shillong, Kurseong and Mussoorie, all of which agree well with my own collected examples from Mussoorie, Darjiling, China and Japan, and with others taken by Dr. Annandale at Naini Tal. Walker originally described it from Nepal.

**MEGASPIS, Macq.**

This is a good genus, but the roughness on the frons, which distinguishes it, is not always easily visible.

A new species closely allied to, yet quite distinct from, *errans*, F., gave me much trouble but Mr. Austen confirms it as distinct, and Osten Sacken's note (Ann. Mus. Gen., xvi, 441) about the presence of the metallic spots on the 3rd and 4th abdominal segments, as remarked after comparison by him with the types, con-



*Megaspis errans*, F.

vinced me that I had correctly determined *errans*, F., from Wiedemann's description in his Auss. Zweifl., although that author did not mention these spots. What hindered my recognition was that a specimen of *errans* was in the Indian Museum collection (apart from other undetermined specimens of the species) labelled in Bigot's handwriting *Erist. cognatus*, Wied., a species which is evidently of similar appearance but is a true *Eristalis*, Wiedemann marking off very clearly those of his species of "*Eristalis*" which we now place in *Megaspis*. The spots vary from shining brassy almost to steel colour and exist in a less degree in my new species.

The species *sculptatus* of V. d. Wulp seems to be separated from *crassus*, F., only by the absence of the large red-and-black spine on the underside of the hind femora, and the abnormal width of the 2nd abdominal segment, which the author says forms the major part of the abdomen, whereas in the common *crassus* it is of normal width.

*Table of Oriental species of Megaspis.*

- A Basal half of wing entirely quite black.  
 B Hind femora bright tawny red, with black tips.  
     Hind femora untoothed below; 2nd abdominal segment abnormally wide .. .. Long. 11 mm. *sculptatus*, V. Wulp  
     Hind femora with distinct black-and-red tooth below, near tip; 2nd abdominal segment normal. Long. 12-15 mm. *crassus*, F.  
 BB Hind femora wholly black. Long. 15 mm. *chrysopygus*, Wied.  
 AA Basal half of wing not black; only normally a little tawny brown.  
   1. Hind femora, basal half tawny, rest blackish brown with soft yellow hair. Thorax almost wholly occupied by an ill-defined blackish square dorsal spot, with a tendency to be divided transversely from each side by a light, very narrow cross-band. Abdomen (more or less *tenax*-like), with a large black triangular spot on the posterior border of each segment, barely reaching the sides. Wings pale yellow, without distinct suffusion, merely the mediastinal cell tawnyish, also base of wings. Face, seen from above, pinkish tawny (♂); greyish with black hair (♀)  
     Long. 10-12 mm. *errans*, F.<sup>1</sup>  
   2. Femora unicolorous, but varying from light brown to blackish; hind pair *never* with tawny basal half and dark apical half. Thorax with a wide, well-defined, quite black uninterrupted transverse band, occupying one-third the vertical length of the dorsum.

<sup>1</sup> In the accompanying diagram of the thorax of this species the dorsal dark marks are shown much more distinct than they really are; the shape of the markings will, however, clearly distinguish the species.



Abdomen (more or less *tenax*-like) with posterior edges of segments black, sometimes showing a tendency in the centre to form a dorsal stripe.

Wings practically as in *errans*.

Face, seen from above, quite white (♂), or yellowish grey, with black vertex (♀).

Long. 11-15 mm. *transversus*, sp. nov.<sup>1</sup>

3. All femora wholly quite black, hind pair with short, stiff, bristly hair.

Thorax blackish, covered with close black hair which on anterior border is reddish yellow.

Abdomen not *tenax*-like, somewhat *intricarius*-like, though not so pubescent; 2nd segment with a broad, bright yellow band, covering nearly the whole segment.

Wings nearly clear, with a distinct blackish brown suffusion in the middle of the anterior border and in a less degree at the base also.

Face grey, with blackish hairs (♂ ♀).

Long. 11-15 mm. *zonalis*, F.

**M. transversus**, mihi, sp. nov.

♂ ♀. India. Long. 11-14 mm.

*Head*: ground colour of frons and face, blackish with white hair (seen from above) in the ♂, and yellowish grey hair with blackish vertex in the ♀. A black frontal stripe more or less visible. Eye-facets small, uniform. Antennæ reddish brown, on very short shining brown prominence; 3rd joint blackish. Back of head grey, posterior orbit of eyes yellow on vertex with short yellowish hair, greyish at sides and below with snow-white short hair. Under side of face blackish. Mouth and proboscis dark brown.

*Thorax*: dorsum greyish tawny (sometimes greenish yellow in front) with yellowish or greyish hair; crossed transversely by a clear-cut wide black band (ground colour) with close short blackish brown hair; this band occupies rather more than one-third the vertical length of the dorsum and is narrowed at the sides. A patch of tawny red hair on each shoulder. Sides cinereous grey

<sup>1</sup> In the accompanying diagram of the thorax of this species the dorsal dark marks are shown much more distinct than they really are; the shape of the markings will, however, clearly distinguish the species.

with sparse hair. Scutellum, of the usual great width, black, with close very short black hair, and some pale hairs on the margin.

*Abdomen* tawny, posterior borders of segments with a black band, wider in some specimens than in others, and with a tendency sometimes on the 2nd segment to form a dorsal band. Centre of 1st segment black. At each of the fore corners of the 3rd and 4th segments is a triangular brassy metallic spot (not strikingly conspicuous, as the colour is so similar to the ground colour) which is somewhat raised, and does not attain the ridged sides of these segments. Whole dorsum covered with short yellow hair, which is darker on the posterior part of each segment; a minute row of black hairs on the extreme edge of each segment. Belly tawny with some yellow hair, centres and posterior halves of the segments more or less blackish.



*Megaspis transversus*, *mili*, sp. nov.

*Legs*: coxæ blackish grey, hind pair with a little yellow hair; femora wholly brown, sometimes lighter, sometimes nearly black, but *always unicolorous*, except that the extreme tip is occasionally lighter, with light golden yellow hair; tibiæ, rather variable, usually with tawny basal half and lighter or darker brown apical half, with yellowish or whitish hair, which is brown or black on the darker parts; tarsi dark brown, with yellowish grey hair below, which is sometimes golden brown under hind pair.

*Wings* nearly clear, a little tawny brown suffusion at base, in the mediastinal cell, and near the base of the discal cell. Halteres yellow.

Described from four ♂♂ and four ♀♀ in fair condition (supplemented by a long series of both sexes in indifferent condition) in the Indian Museum collection from Bangalore and Calcutta. Allied to *errans*, F., but quite distinct. The sub-metallic raised triangles on the abdominal 3rd and 4th segments are identical with those in *errans*, F., but the hind femora are *never* pale on the basal half and dark on the apical. This character alone, or the thoracic markings, will at once separate the two species.

### POLYDONTA, Macq.

(?) *P. orientalis*, *mili*, sp. nov.

(*Id. id.*, Bigot, *nom. nud.*)

♂. Orient. Long. 11 mm.

*Head*: eyes touching for a short space only, facets small, uniform; vertex small, with some black hair. Antennæ on a moderate

prominence, both blackish, 3rd joint brownish orange, with orange arista. Frons and face with whitish hair, yellowish brown mixed with black above the antennæ; facial callus of moderate size, shining, bare; proboscis and mouth, brownish black. Back of head dark grey, with a narrow fringe of short greyish yellow hair, which is longer below the head.

*Thorax* blackish, covered with light yellowish grey pubescence which also occurs in front of the wing-insertion, on the cinereous grey sides of the thorax. Scutellum tawny, with rather long yellowish grey erect pubescence.

*Abdomen* light chestnut-brown; 1st segment and base of 2nd in middle, blackish; 2nd segment, towards the posterior border, 3rd and 4th segments, both at base and towards posterior borders, with broad black transverse bands, slightly elevated; extreme edges of segments pale. Whole abdomen lightly clothed with pale yellow hair, which is much longer and thicker on the yellowish belly, on which some traces of black transverse bands can be seen. The abdomen consists of only the four distinct segments as described; unless a fifth segment can be recognised in a bare brown curved plate twisted to the *left side* of the large genital process, which is shining brown, bare, biglobular; the lower globe bearing on its under side some further small appendages.

*Legs*: coxæ dark brown, with pale yellow hair; trochanters much lengthened, brown, with some black marks and yellow hairs; anterior femora blackish, except pale tips, with soft yellow hair; hind pair enormously enlarged, blackish on upper side, and on apical half below, with a broad black ring round the middle, most distinct on the outer side; on the lower side (apical half) is a collection of short black spines, whilst soft yellow hair occurs rather thickly on the upper side, and on the basal half below; scattered long yellow hairs occurring over the whole femur more or less. The basal half of the femur below is considerably cut away, the vacancy being replaced by a prominent, tawny yellow tooth, closely covered with long yellow hair. Tibiæ brown, lighter at base, with yellow short pubescence; hind pair shining chestnut-brown, much curved, almost bare, and terminating in a point inwards. Tarsi dark brown, the metatarsus thicker than the rest of the joints.

*Wings* very pale grey—not darker at base; two minute blackish suffusions at the stigma, and on the spurious vein just below the fork of the 3rd longitudinal vein. Halteres very short, pale yellow, covered wholly by the dirty white tegulæ, which bear whitish hairs on the margins.

Described from a single ♂ in fair condition in the Indian Museum collection, bearing no data, but marked "Inde" in Bigot's handwriting.

*N.B.*—I leave this species in *Polydonta*, as being the most suitable genus to receive it, as the shape of the abdomen, venation, and pointed curved hind tibiæ all agree perfectly with Macquart's description and figure. There are, however, several points in

which it very materially differs from the definition given by Macquart.

Firstly, he says the front in the ♂ (the only sex given) is moderately wide, whereas in my specimen the eyes touch for a distinct space; but possibly Macquart's specimen was a ♀; secondly, the hind femora in my species are very greatly enlarged, in the same proportion as in *Syrhitta*, whereas Macquart's description is only "épaisses"; moreover they are barely curved at all, much less possessing the extraordinary curvature shown in Macquart's figure (Dip. Ex. Supp. iv, pt. 1, pl. xiii, fig. v c.). Again, though that figure shows a small tooth at the base below, it is not so conspicuous as in *orientalis*.

The genus was established for *bicolor*, Macq., from Nova Scotia, and has not been previously recorded from the East; but, knowing of no other in which to place the Oriental species, I leave it here, where Bigot placed it.

Apart from the question of the location of *orientalis* in *Polydonta*, the genus requires renaming, being preoccupied in Mollusca by Fischer in 1807.

I might add that Bigot's label reads "*Polydnota*," but I presume he means *Polydonta*.

The type-specimen only possessed one tarsus, which has, unfortunately, been broken off since my describing it, but I noticed particularly, the slight thickening of the metatarsus below, mentioned by Macquart.

### **EUMERUS**, Mg.

#### **E. argyropus**, Dol.

(*E. argentipes*, Wlk.)

There are three ♂ ♂ and a ♀ from Assam in the Indian Museum collection which I have identified with this species.

#### **E. nepalensis**, mihi, sp. nov.

♀. Nepal (Chonebal). Long. 8 mm.

*Head* very shining black, face below antennæ, black, antennæ bright tawny red, the *edge* of the 3rd joint black.

*Thorax* dark shining ænous black, with tawny grey pubescence on dorsum, and grey pubescence at the sides; scutellum unicolorous, with soft, rather long yellowish grey hair, posterior border with a flat edge which is serrated above.

*Abdomen* shining black, with two oval, oblique pale spots on 2nd segment, their ends touching the posterior border of the segments near the side margin; extreme posterior border of segments very narrowly tawny. On the 3rd segment are two smaller and narrower spots similarly situated; on the 4th segment, two hardly visible pale grey similar spots with white hair. Sides and tip of abdomen with white hair. Belly black, pale in centre.

*Legs* black, femora fringed with whitish hair below, posterior femora with black hair on upper side; the basal half and tips of the femora, four anterior tarsi, tip of posterior metatarsus, and apical half of next joint, tawny yellow: under side of whole posterior tarsi with bright golden yellow pubescence; four anterior tarsi with some white hairs at base.

*Wings* clear, iridescent, veins well marked, stigma brown; tegulæ and halteres yellowish.

Described from the one type-specimen in the Indian Museum collection. It is near *argyropus*, Dol., but distinct by the wholly clear wing.

N.B.—I have a *Eumerus* taken by me at Mussoorie, 20–24-vi-05, and another species taken by me at Lucknow, 2-xii-04, but shall reserve these for further consideration. The first I cannot identify with any of Schiner's species, but in view of the forty known European species, any one of which it may be, I refrain from describing it as new.

### SYRITTA, St. Farg. et Serv.

In a subsequent paper I hope to deal with this genus. Five species have been recorded from the East, all apparently bearing considerable resemblance to one another. *S. pipiens*, L., the very common European and North American species, has not been recorded, but I have taken it myself not only at Mussoorie and Darjiling, but from the Indian plains also. My first impressions derived from a study of the Oriental species of this genus are that there may be only three species: (1) *pipiens*, L., of which *orientalis*, Mcq., and *indica*, W., may be synonyms; (2) a species with the pairs of spots replaced by entire bands which, when interrupted, are only very slightly so. This species would be *amboinensis*, Dol., with *illucida*, Wlk., as a possible synonym, although in the latter the bands are straight, whilst in *amboinensis*, Dol., they are not so. The third species varies from both, but approximates most to *pipiens*.

On the other hand there may be eight or ten good species. One specimen in my own collection taken by me at Agra, 4-iv-05, has the posterior femora nearly wholly bright red and the 2nd pair of abdominal spots also reddish.

An example in the Indian Museum collection has the second pair of spots nearly as large as the first pair, whilst a third species, which occurs in Calcutta and elsewhere (Karachi), has a broad pale entire band occupying two segments. This is labelled *S. laticincta*, Bigot, which is I believe a *nomen nudum*, but the *species* may be a good one. Other specimens in inferior condition in the Indian Museum collection may prove to be still further species.

### XYLOTA, Meig.

The Indian Museum possesses specimens named by Bigot, *cuprina*, *cupropicta*, *flavitaris*, and *auronitens*, all being his own

species. Of these *cuprina*<sup>1</sup> is a described species and the ♂ and ♀ ♀ of it apparently are co-types, and therefore, presumably, correctly identified. *Cupropicta* and *flavitaris* (two ♀ ♀ and one ♀ respectively) are certainly only the same species as *cuprina*, and are probably *nomina nuda*. The other species, *auronitens*, is apparently a good species, which I describe here, with a second very distinct species from Assam.

**X. *auronitens*, mihi, sp. nov.**

(*Id. id.*; Bigot, *nom. nud.*)

♂. Assam. Long. 12 mm.

*Head*: vertex shining black, a few yellow hairs immediately above junction of eyes, which are contiguous for only half the distance from the frontal prominence to the crown of the head. Facets small, of uniform size, except being a little larger where the eyes touch; ocelli distinct, no ocellar prominence. Frons shining black, grey dusted round the margins, with lower edge immediately above the antennæ, tawny. Cheeks and lower part of face blackish, with a brownish blue tinge, with whitish reflections in certain lights. Antennæ reddish brown, 3rd joint lighter, whitish dusted; arista reddish brown. Mouth and proboscis brown. Back of head grey, encompassed by a fringe of gold-yellow hair, which is shortest behind the upper corners of the eyes.

*Thorax*: dorsum golden brassy, with gold-yellow hairs, which are absent in the centre, giving an appearance, seen from behind, of a dark dorsal stripe. Humeral calli, bluish black, with a few yellow hairs. Sides of thorax blackish, shining, with some scattered yellow hairs. Mesopleura, pteropleura and sternopleura, ænous grey, shining, with yellow hairs. Metanotum ænous, bare. Scutellum brassy gold, with rather close, moderately short, yellow hair.

*Abdomen*: 1st segment ænous, with a slight brassy tinge; 2nd, tawny brown, shining, posterior border blackish; the colour extending forward in the centre as a partial dorsal stripe; 3rd, tawny brown, shining, posterior part, blackish; the colour widest in the centre; 4th, ænous shining, reddish brown towards posterior border. Tip of abdomen reddish brown. Belly red-brown, black at base. The whole abdomen—dorsum, sides and belly—is covered with short, soft yellow hair.

*Legs*: coxæ shining ænous, posterior pair with yellow hair on outer sides; femora ænous, with soft yellow hair, extreme tips tawny; tibiæ and tarsi bright tawny with yellowish pubescence, apical half of tibiæ blackish, especially in fore and hind pair, the fore tibiæ bearing a fringe of long yellow hair on their inner sides.

<sup>1</sup> This specific name has been used for a second time by Coquillett for a species from Japan described by him in 1898 (*Proc. U. S. Nat. Mus.*, xxi, 327). Bigot's species therefore antedates this latter by thirteen years.

*Wings* pale grey, mediastinal cell uniformly brownish yellow; no distinct stigma. Halteres bright yellowish red. Tegulae whitish grey.

Described from a single ♂ in good condition in the Indian Museum collection from Margherita.

This species must be very near *nigroaenescens*, Rond., but his description of the abdomen does not quite agree, and he says the antennae are black, whereas in *auronitens* they are bright reddish brown. My longer description will enable some author to decide whether it is synonymous with Rondani's species or not.

**X. assamensis**, mihi, sp. nov.

♀. Assam (Kohima). Long. 13 mm.

Frons shining black narrowing towards vertex, a slight trace of a grey pollinose line across the centre; face below antennae tawny, with minute not very strongly marked silvery white pubescence; proboscis blackish brown; antennae brown; a fringe of yellowish hair behind eyes at the sides.

*Thorax*, dull violet bronze, nearly bare, sides black, some yellow hairs in front, at the base of the wing; scutellum unicolorous, yellow hair at sides and on posterior border.

*Abdomen*, dull violet aëuous, nearly bare, but with minutely yellowish pubescence seen from in front.

*Legs*, bright red tawny, with very slight yellow hair; coxae black; posterior femora with traces of a brown mark in the middle of the upper side.

*Wings*, pale yellowish tawny, stigma tawny. Halteres brown, alulae brown with a fringe of thick yellow hair behind.

Described from one ♀ in the Indian Museum collection.

The Oriental species of this genus may be separated thus—

Abdomen with distinct bands or spots.

Legs black. . . Long. 11 mm. *nigroaenescens*, Rond.

Legs partly tawny.

Abdomen with two broad interrupted testaceous bands.

Thorax unstriped; antennae black; basal half of femora pale . . Long. 8 mm. *calopus*, Big.

Thorax with two testaceous tomentose stripes; antennae tawny; femora chalybeous.

Long. 10 mm. *conformis*, Wlk.

Abdomen with six bands.

Long. 12 mm. *aqualis*, Wlk.

Abdomen unicolorous, or at least, without distinct bands or spots.

Legs tawny or red.

Abdomen tawny towards the base.

Long. 10 mm. *aethusa*, Wlk.

Abdomen all shining violet.

Long. 13 mm. *assamensis*, mihi, sp.

Legs not tawny (metallic blue, green, nov.

aëuous or black: in *ventralis* "dingy testaceous").

Belly with two very broad testaceous stripes

.. Long. 9 mm. *ventralis*, Wlk.

Belly without pale stripes.

Long. 10-11 mm. *cuprina*, Big.

### MILESIA, Latr.

In this genus there is little to record.

Only two new species have been described recently; these are—

**M. balteata**, Kert., 1901, Termés. Füzet., xxiv, 414; Sikkim.

**M. semifulva**, Meijere, 1904, Bijd. Dierk., xviii, 19; Darjiling (figured).<sup>-</sup>

To these I add two undescribed species in the Indian Museum collection named by Bigot *variegata* and *himalayensis*.

For a table of most of the species up to 1882, Baron Osten Sacken's notes in the Berl. Ent. Zeits., vol. xxvi, 187, can be consulted.

Two other species are in the Indian Museum collection determined by Bigot; two ♂♂ of *conspicienda*, Wlk., from Sandakari, and two ♂♂ of *gigas*, Mcq. (*Sphixea*), without data.

**M. variegata**, mihi, sp. nov.

(*Sphyxæa variegata*, Bigot, *nom. nud.*)

♂. Sikkim. Long. 20 mm.

*Head*: vertex narrow, black, with black hairs; a small yellow triangle just above the juncture of the eyes, which are contiguous for only a short space. Frons and face bright lemon-yellow, with a broad, shining black stripe on each cheek; frontal prominence, blackish brown. Antennæ red-brown, 1st and 2nd joints with one or two strong bristles above and below towards the tips. Proboscis blackish brown. Back of head grey, posterior orbit of eyes with yellow hair, longest below.

*Thorax* mainly blackish. Humeral calli with a small oblong spot below each; præalar calli, meso-, ptero-, sterno-, and metapleuræ, also posterior border of thoracic dorsum, bright lemon-yellow. Two greyish stripes, narrowed behind, extend from the anterior margin to the centre of the dorsum, where they meet two similar ones extending inwards from either præalar callus. Scutellum black, the posterior half yellow, with yellow hair; the whole thorax and scutellum covered with short, soft yellowish grey hair.



*Abdomen*: 1st segment shining black, yellowish towards each side in front; 2nd segment lemon-yellow with a very narrow black posterior border; a dorsal, clean-cut, rather narrow black stripe extends more than half the distance from the base, when it meets a transverse narrow line, almost parallel with the posterior border, but curved forward towards the sides; 3rd and 4th segments pinkish brown, with very narrow, black posterior borders, and a short narrow, dorsal stripe, which immediately divides, and extends to each side in the shape of a loop, attaining the edge just before the middle of the segment. Posterior half of 3rd segment



*Milesta variegata*, mihi, sp. nov., ♂.

blackish, the colour extended forwards in the middle; the 4th segment is narrowly black at the base. Genitalia not conspicuous, yellowish brown. The whole abdomen is covered with short yellow hair on the yellow parts, and short black on the remainder, with rather long yellow hair at the sides, and with a row of moderately long black hairs on posterior border of the 4th segment.

Belly yellow on basal half, with a blackish, narrow central line; blackish on posterior half, all covered with light yellow soft fluffy hair.

*Legs*: fore coxæ shining black with soft yellow hair; posterior coxæ apparently yellow, with a black streak below, all covered with close long yellow hair. Femora orange-yellow, with a long black streak on under side; hind pair with a diffused black streak above also, and bearing a moderately long orange-yellow spine below, near the tip. All the femora with long yellow hair, with some short rows of black hair intermixed; the hair being scarcest on the upper side of the four anterior femora, and thickest on the lower and inner sides of the hind pair. Tibiæ tawny brown, the fore pair darker towards the tip, the middle pair much lighter, the hind pair darker; all the tibiæ with minute yellow pubescence, and with long yellow hair on the under side, consisting of a single shorter fringe on the fore pair, a long and a short fringe on the middle pair, the hind pair being densely covered on the whole of the lower and inner sides. Tarsi yellowish tawny, with short yellow pubescence; upper sides blackish brown.

*Wings* pale grey, brownish along anterior margin, and the

slightest possible trace of a dark diffusion towards tip. Halteres: stems yellow, knob red-brown.

Described from a perfect ♂ in excellent condition in the Indian Museum collection from Sikkim. A very conspicuous species.

*N.B.*—This may be the ♂ of Walker's *M. lamus*, described from an unknown locality. The description of the abdomen agrees very well, but my specimen has no frontal stripe from the antennæ to the mouth. The markings on the sides of the thorax do not quite agree; my species has no distinct black spots on the belly, nor does Walker, in spite of his minute description of the feet, mention the conspicuous streaks on the under side of the femora, which are present in *variegata*. The black band across the vertex, with a second stripe extending to the antennæ would probably be a sexual character. The black posterior border of the 3rd segment extends to the base of the 4th, therefore there is less difference between Walker's "fore border" of 4th segment, and my "posterior border of 3rd," than would at first appear.

***M. himalayensis*, mihi, sp. nov.**

(*Sphyxæa himalayensis*, Bigot, *nom. nud.*)

♂ ♀. Assam and North India. Long.: ♂, 20 mm.; ♀, 17 mm.

*Head*: ♂: vertex shining black, a very small grey-haired triangle just above the junction of the eyes. Frons and face blackish grey, shining, with silvery reflections, seen from above; frontal prominence, dark brown (antennæ missing). Back of head grey, posterior orbit of eyes with a little short greyish hair.

♀: frons yellowish grey; a broad shining bare black stripe (occupying nearly the whole width of the frontal space) extends from the vertex to the frontal prominence. Lower part of face and cheeks shining black, nearly bare, without whitish reflections, but with traces of a greyish stripe on cheeks. Antennæ tawny.

*Thorax*: ground colour blackish, covered with close ferruginous brown hair (♂); or greenish yellow tomentose, with greenish yellow hair (♀). Humeral calli concolorous in ♂, yellow, with yellowish hair in ♀, with a small, oval, yellow spot below them. Sides of thorax, dark grey, with considerable brownish, rough hair in ♂; barer in ♀ with a little sparse grey hair, and a stripe below wing-insertions, extending to the scutellum, which is light brown in ♂ and yellow in ♀, in both sexes with yellow hair.

*Abdomen* in ♂ dark brown; in ♀ shining metallic blue; in both sexes, with a broad bright lemon-yellow band at the base of the 2nd segment, occupying more than half of it. A very narrow yellow band near the base of the 3rd segment in ♀.

The dorsum is covered in the ♂ with yellow hair mixed with black, but wholly yellow on the cross-band. That on the sides of the abdomen is brown, except towards the base, where it is longest, and is yellow and silky. In the ♀ the dorsum is clothed with yellow hair on the cross-band, and minute black hair elsewhere,

except at the sides towards the base, where it is thick and yellow, but shorter than in the ♂.

*Legs* black, shining, with some blackish brown hairs on hind pair, a not very strong black tooth on under side near tip (♂ ♀). Femora black, tips tawny, some black short bristly hair, mixed with yellow hairs on the lower side of the fore pair: the middle pair have long brownish yellow hair above and below (much longer in the ♂); the hind pair in the ♂ are covered with long yellow hair on the upper side, and longer brown hair on the under side; in the ♀ there is short yellow silky hair on the upper side, and brown hair below, which is neither as long or as thick as in the ♂. The fore tibiæ (♂ ♀) are tawny, with a long black streak in front, extending from the tip nearly to the base. In the ♂ there are minute black hairs in front, and longer black silky hair behind; in the ♀ they are nearly bare, only a few short, black hairs being present. The middle pair are bright lemon-yellow (♂ ♀), and have soft pale yellow hair in the ♂, which is very long behind; whereas in the ♀ they are almost bare, except for some moderately long pale yellow hairs behind. The hind tibiæ are blackish brown (darker in ♂); the tips narrowly brown (♂) or the colour spread more or less over the upper side towards the tip (♀). The ♂ has a row of long and very thick dark brown hair on the front, outer and hindmost sides, being longest on the latter, whilst the ♀ has only very short black hairs, which attain to a short row of bristly hair on the upper side; and some moderately long silky brownish black hair on the lower side. Tarsi blackish brown, with short black hairs; basal joint of middle pair pale yellow in ♀ above and below; under side of hind pair with gold-brown short pubescence.

*Wings* pale grey, a little darker yellowish brown from the anterior margin to about the 3rd longitudinal vein. Halteres tawny. Tegulæ pale yellow, with long yellow hair.

Described from a ♂ from Assam (Sibsagar) and a ♀ from Sikkim, both in the Indian Museum collection in excellent condition. A very conspicuous species.

### DEINECHES, Wlk.

#### *D. simioides*, mihi, sp. nov.

(*Id. id.*, Bigot, *nom. nud.*)

♂. Orient. Long. 18 mm. (without snout).

*Head*: vertex black. Eyes reddish bronze, facets uniform, touching for only a short space above frontal prominence. Antennæ light reddish brown, situated on a short black prominence. Snout produced. Face black, shining, with a greyish dusted wide stripe on each side. Back of head blackish grey, nearly bare.

*Thorax* obscure blackish grey (apparently). Humeral calli brown; a greyish stripe on sides. Scutellum blackish, hairy. The whole dorsum and sides of thorax clothed with thick blackish grey and brown hair.

*Abdomen* clothed with dense *Bombus*-like pubescence, which is yellowish on basal half (except the extreme base, which is barer and apparently tawny), followed by a wide blackish band of hair; the tip of the abdomen being clothed with red hair. Belly blackish; the last segment covered with dense black and reddish hair. Genital organ black, shining.

*Legs* reddish brown; fore femora with broad dark brown band near tip; middle pair with a black streak on inner under side, and a shorter one on outer side near tip; hind pair apparently unmarked. All the femora with more or less scattered black hair, which on under sides becomes longer and bristly. All the tibiæ with short stiff black hairs. Tarsi with short black hair, mixed with some yellowish ones; under side of hind tarsi rich golden brown.

*Wings* brown; anterior half and basal half much darker; centre of 1st and 2nd posterior cells very slightly clearer. Halteres yellow.

Described from one ♂ in the Indian Museum collection.

No distinct locality is given on the specimen, the label bearing the statement "*Deineches simioides*, Big., sp. nov., Inde," "Inde" being a general expression of that author's to include Malay species as well as Indian ones.

Owing to the bad condition of the specimen, I would not have described this species, except that, in spite of its state, the specific characters are sufficiently obvious and the generic characters agree perfectly with Walker's description and plate in *Ins. Saunders. Dipt.*

Moreover, the genus has not been recorded from the Orient before, having been established for a species from New South Wales.

### AZPEYTIA, Wlk.

#### A. bifascia, mihi, sp. nov. (Pl. xiii, figs. 1—5.)

♂. Assam (Margherita). Long. 14 mm.

*Head* black, antennæ prominence small; front, vertex, and lower part of face with strong black hairs; eyes absolutely contiguous for a short space, slightly diverging towards vertex; antennæ dark brown, arista black, but base very distinctly thicker, and distinctly ferruginous; outer ocular orbit with a fringe of short yellow hairs.

*Thorax* black, moderately shining, with a rather thick covering of short bright yellow hair, which is, however, invisible if viewed directly from above. This yellow pubescence extends over the sides also. Scutellum nearly of the full width of thorax, tawny, darker at base, covered with thick yellow hair.

*Abdomen* black, moderately shining, with very short, rather thick black hair. On the sides of the 2nd segment, a very large pale ænous triangular spot, covered with yellowish grey hair;

extreme edge of the abdomen, except just before the tip, with a fringe of short bright yellow hair.

*Legs* wholly brown, with yellow hair on outer side of all tibiae, on the coxæ, and on hind femora; the latter with a fringe of brown hair on more than the apical half below.

*Wings* yellow, veins tawny brown, stigma tawny brown, placed near tip of wing; halteres and tegulæ yellowish brown.

Described from the type-example in the Indian Museum collection.

It is interesting to add a second species to this curious genus originally described by Walker from Papua. The inflexed portions of the 3rd and 4th longitudinal veins (Verrall's subapical and postical veins) are considerably curved, exactly as in *Merodon*.

### LYCASTRIS, Wlk.

**L. albipes**, Wlk. (Pl. xi, figs. 14, 15.)

(Syn. *Xiphopheromyia glossata*, Big.)

A ♂ from Mussoorie in the Indian Museum collection agrees with the author's description, except that the pubescence is yellowish instead of white, yet I have no doubt of it being this species. Walker says the legs are white. The specimen only possesses one leg (fore leg), which is yellow with black base to the femora.

**L. flavohirta**, mihi, sp. nov. (Pl. xi, figs. 16, 17.)

♂. Darjiling. Long. 10 mm.

Antennæ protuberance and snout all shining black, except a yellowish streak each side, commencing broadly at the eye, just below the antennæ, and gradually narrowing, extending nearly to the tip of the snout. Proboscis black. Antennæ black, 3rd joint dark reddish brown, arista bare. Eyes quite bare, contiguous only immediately above the antennæ, thence diverging rather widely to the vertex, which is yellowish black with a few long grey hairs; ocelli distinct, small, well separated. Sides and under side of head with pale yellow hairs, shortest above, longest near the mouth.

*Thorax* ænous, blackish grey at sides, dorsum and sides with long pale greenish yellow hair, thickest on posterior part. Scutellum unicolorous, with long yellow hair.

*Abdomen* bright yellow, 1st segment wholly ænous black on dorsum, the colour extending to the 2nd segment in the form of a triangle on the base of the segment. The whole abdomen covered with long soft hair, which is greenish yellow on basal segments, and bright yellow on the rest. Belly wholly yellow, with short yellow hair.

*Legs* bright yellow, coxæ, and about basal half of femora, black; anterior tarsi wholly, middle pair at tip, black; posterior metatarsus very long, and with extreme tip of tibiae red, tips of posterior tarsi black. All the femora have a fringe of yellow hair,

longest in the centre; anterior tibiæ bare, middle pair with fringe of long yellow hair, posterior pair with yellow hair behind on apical half.

*Wings* grey, yellowish at base, slightly suffused at base of 2nd and 3rd longitudinal veins; over the discal cross-vein, and at wing-tip; discal cross-vein is placed nearly at the tip of the discal cell, and is very oblique; and the spurious vein is very distinct and complete; a few veinlets between the subcostal vein and the costa (this latter peculiarity being also the case in *L. albipes*). Halteres very small, knob brown, tegulæ pale grey, edge yellow, with short yellow hair.

Described from one ♂ in my collection taken by me at Darjiling, 10-15-ix-05 (type), and a ♂ in the Indian Museum collection also from Darjiling, taken 25-ix-06.

### BRACHYPALPUS, Macq.

(?) *B. dives*, mihi, sp. nov.

♂. Assam (Kohima). Long. 17 mm.

Whole face yellow with silvery yellow tomentum; antennæ yellow, 3rd joint darker, eyes contiguous for half the distance to the vertex; proboscis brown, posterior orbit of head entirely encircled by a fringe of bright yellow hair.

*Thorax* ground colour ænous with a slight violet tinge on the dorsum, covered with rather thick short yellow hair. No signs of stripes or bands. Sides of thorax cinereous, with a thick elongated bunch of yellow hair just in front of and below the insertion of the wings, scutellum ænous, thickly covered with yellow hair; the extreme edge is narrowly ridged all round and is yellow.

*Abdomen* elongated, much narrower than thorax and only slightly narrowing toward apex, brilliantly shining golden yellow, 1st joint dull ænous green, the whole abdomen thickly covered with golden yellow hair which is longest at the sides and tip. Belly yellow, nearly bare.

*Legs* bright yellow, fore pair normal, the femora rather thickly yellow haired; the middle femora are distinctly, though not greatly enlarged towards the tip, with a fringe of long golden yellow hair in front and behind and a shorter fringe above; the middle tibiæ have, above and below, excessively long and thick golden yellow hair; the hind femora are slightly and uniformly thicker, very slightly pale brownish with a blackish streak on upper side, and are covered with moderately long golden yellow hair—the tooth on the under side is near the tip and is followed by a semicircular protuberance marked with black; the hind tibiæ are well curved, yellowish brown, darker on inner side, slightly narrow at the base, near which is a distinct tooth; black hairs on the inner side and a narrow row of pale yellow hair on the outside. The four anterior tarsi yellow, with some small black spines at the tip of each joint, hind tarsi similar, but brownish, with golden brown thick short

pubescence on under side and long black hair, bushy and straggly, on the outer side.

*Wings* pale yellowish, anterior border to the subcostal (1st longitudinal) vein, a little deeper yellow. Halteres, yellowish brown; tegulæ yellow, both with a fringe of thick yellow hair.

Described from one ♂ in perfect condition in the Indian Museum collection.

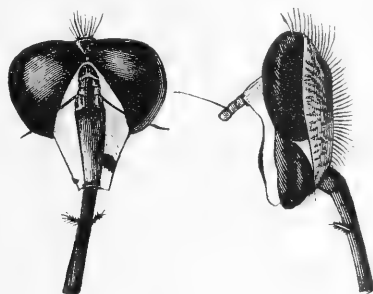
I am not certain of the position of this species here, but the only difference it shows from *Brachypalpus* is its insufficiently thickened posterior femora. It is a magnificent species.

### CRIORHINA, Mg.

(?) *C. dentata*, mihi, sp. nov.

♂. Simla district. Long. 11 mm.

*Head*: antennal protuberance rather prominent, face much excavated below antennæ, and bearing a central knob. Eyes black, sub-contiguous for only a very short space, facets smaller round the outer parts. Vertex moderately narrow, raised, black, with long



*Criorhina dentata*, mihi, sp. nov., ♂.

black hair in front, and tawny brown hair behind, on posterior edge. Face dull yellowish, with, seen from above, a silvery white dusted reflection; upper side of antennal prominence shining black. Antennæ red-brown; a few hairs on upper side of basal joints; arista, orange, bare. Whole side of the produced snout, from the eyes to the tip, shining black, bare; a central wide bare shining brown stripe from base of antennæ to tip of snout, mouth black, proboscis dark brown, rather long. Back of head grey; posterior orbit of eyes with a fringe of grey hair which is shortest behind the vertex and longest on under side.

*Thorax* ænous, with a slight reddish coppery tinge, closely covered with thick long light brown hair, which extends over the concolorous scutellum, but is almost absent at the base of the latter, and longest of all and erect on the posterior border of the same. Sides of thorax blackish grey, shining, with thick long brownish grey hair. A small yellow callus a little below the shoulder, bearing apparently microscopic cream-coloured pollinosity. A small oval

callus, hollowed in centre, above each hind coxa, bearing very short cream-coloured pubescence. Metanotum, shining black, bare.

*Abdomen* : 1st segment dull bluish grey, blackish at base with a bunch of pinkish brown hairs in the centre of the posterior border ; 2nd, 3rd and 4th segments with the basal half sub-metallic dull bluish black, and the apical half sub-metallic brownish black with a light brown posterior edge (widest on 4th segment). Each segment is indented transversely by a narrow grey band bearing short grey hair, the hair in front of it being light brownish grey and on apical half brownish black. Tip with brown hairs, genitals black, concealed, globular, with black hairs. Belly blackish, with greyish hairs, posterior borders of segments tawny.



*Criorhina dentata*, mihi, sp. nov., ♂.

*Legs* : coxæ blackish, fore pair with whitish reflection and grey hair ; hind pair yellowish, streaked with black above, with yellowish grey hair below. Femora black, extreme tips orange-yellow, basal half of middle pair below, and a basal band on hind pair, orange-yellow. The hind femora are barely thicker than the others and bear a distinct wide tooth on the under side near the base. All the femora considerably covered with light greyish hair, mixed with some brown hairs, the under sides bearing the longest hair. Tibiæ : rather more than basal half of anterior pairs brownish yellow, the rest black, hind pair nearly all black ; all with short whitish hair. Tarsi : anterior four brownish yellow, with darker tips and traces of a darker central line ; hind pair dark brown, with the upper side mainly black.

*Wings* pale grey ; stigma dark brown ; cross-veins lightly suffused for a small space with brown. Halteres yellow. Tegulæ, transparent white, with yellowish brown border bearing long white hair.

Described from a ♂ in the Indian Museum collection taken at Kodiali, Simla district.

*N.B.*—This species may require the erection of a new genus, as it varies from typical *Criorhinæ* in several particulars, but I know of no other genus in which it can be placed. Its points of difference are the prominent antennal protuberance, the distinct central knob on face, the contiguity (sub) of the eyes for only the shortest possible distance, the straight outer side of the 3rd antennal joint and the barely thickened hind femora bearing a distinct tooth,



**SERICOMYIA**, Mg.

**S. himalayensis**, mihi, sp. nov. (Pl. xiii, figs. 6, 7, 8.)

♂. Sikkim. Long. 12 mm.

Entire frons, cheeks and lower part of head bright yellow, with some yellow hair immediately below eyes, at the sides of the cheeks, and lower part of head behind; eyes comparatively rather small, contiguous for only the shortest space, facets very small, especially on lower part, but with no distinct line of demarcation; vertex very small, slightly raised, with a few black hairs; a few black hairs also just above the antennæ, which are rather small, black and plumose above and below.

*Thorax* yellowish grey, entirely covered with moderately thick yellow hair, which is longest at the sides and on the posterior border; dorsum cinereous, with short yellow pubescence, and black hairs in the centre, this pubescence being hardly visible from above. Scutellum tawny, with rather long yellow hair.

*Abdomen* bright yellow with a black band, indistinct in the middle, on the posterior borders of 2nd, 3rd and 4th segments; the whole abdomen with minute yellow pubescence and some longer yellow hair at the tip; belly bright yellow.

*Legs* tawny, with thin yellow hair; femora (except tips) brownish; posterior pair nearly black; tarsi tips brown.

*Wings* pale grey, a dark brown moderately broad band from beyond the tip of costal cell, reaching from the fore border to the upper part of the discal cell and the lower transverse vein.

Described from one ♂ from Sikkim in the Indian Museum collection.

This genus has not been previously recorded from the Orient.

**CHRYSOTOXUM**.

**C. sexfasciatum**, mihi, sp. nov. (Pl. xiii, fig. 9.)

♀. India. Long. 13 mm.

Entire head yellow, with an orange central facial line below antennæ. Vertex shining blackish bronze reaching from eye to eye, moderately broad in front of the three ocelli, back of head continuously yellow above, but whitish behind lower portions of eyes, yellow haired above, white haired on lower part of orbit. Face minutely yellow haired. Eyes bare, facets very small. Antennæ protuberance brown, black at base above; antennæ, 1st two joints tawny brown, 3rd joint black, base tawny brown, arista tawny brown. Proboscis yellow, base black.

*Thorax* tawny yellow, parts of the pleuræ brassy, sides of dorsum lemon-yellow, dorsum ænous with two narrow central pale stripes placed near together; scutellum lemon-yellow, centre darker; whole dorsum of thorax and scutellum clothed with short soft pale yellow hair.

*Abdomen* tawny yellow; 1st segment very short, posterior border narrowly black; 2nd, 3rd and 4th segments more yellow on basal half and tawny on apical half, with two black oblique elongated oval streaks in the disc, pointing to posterior corners, those on the 2nd segment meeting towards the base of the segment in the centre. The base of 2nd, 3rd and 4th segments towards the sides and widening at the edge, black; 5th segment tawny brown with two oblique oval semi-lunate lemon-yellow fascia.

*Legs* yellow, coxæ brown.

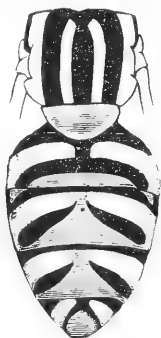
*Wings* nearly clear, slightly yellow below the pale brown stigma. Halteres pale yellow.

Described from the above type in the Indian Museum collection taken 23-31-xi-07, at Rampore Chaka, Bijnor district, United Provinces.

**C. citronellum**, mihi, sp. nov.

♂. Ceylon. Long. 12 mm.

*Head*: vertex very small, black with a few black hairs; ocelli distinct, red, well separated. Eyes touching for half the distance from vertex to frontal triangle, facets very small, uniform. Frontal triangle small, black, with blackish brown hairs, lower part shining. Antennæ, base black (rest missing). Face bright greenish yellow, bare, with a black stripe from the antennæ, continued distinctly into the mouth cavity for some distance, each side of this stripe being narrowly tawny. Proboscis short, black. Under side of head pale livid orange. Back of head black; posterior orbit of eyes whitish, with a fringe of short white hairs, replaced behind the vertex by yellowish hairs.



*Chrysotoxum citronellum*, mihi, sp. nov., ♂.

*Thorax*: sides of dorsum occupied by a thick, wide greenish yellow stripe. Rest of dorsum shining greenish black, with two central, longitudinal, moderately wide ochreous yellow stripes, separated from each other by about the width of one of them. Sides of thorax shining black, with some yellow hairs. Mesopleuræ and an oval spot on upper part of sternopleuræ, greenish yellow; metapleuræ pale yellowish grey. Scutellum, disc, brownish, shining with brownish hairs, posterior edge, greenish yellow.

*Abdomen* : tricolorous ; greenish yellow, black and tawny orange, in about equal proportions. Difficult to decide on a ground colour: The best plan is to consider the abdomen as black: 1st segment very narrow, brownish, with some hairs. On each of the 2nd, 3rd and 4th segments are a pair of arched greenish yellow lunules of uniform width, almost contiguous at the base of the segment, and curving thence (convex side uppermost) to the posterior corners, where they attain the border, slightly widened. These lunules are repeated on the 5th segment, on which they are almost perpendicular. The posterior border of the 2nd, 3rd and 4th segments is tawny orange, being much wider in its centre on the 2nd segment; whilst on the 3rd and 4th segments it spreads forwards in the shape of a triangle, of which the apex distinctly attains the base of the segment, where it separates the two lunules. This pattern is repeated on the 5th segment, but in a more exaggerated form perpendicularly (as though laterally compressed); thus reducing the black part between the yellow lunules and the orange triangle to two narrow streaks. The whole dorsum is very sparsely covered with short yellow hairs, and there is a fringe of very short black hairs along the edge of the whole abdomen, and a bunch of yellowish hair on the anterior corners of the abdomen. Genitalia inconspicuous.

*Legs* : fore coxæ greenish yellow, bare; posterior coxæ, dark brown, shining, with a little brownish hair. Femora and tibiæ mainly greenish yellow, distal half of hind femora and tibiæ, and all the tarsi, wholly, tawny orange. Legs practically bare, but the femora have some very short light yellow hairs on the under side.

*Wings* pale grey; anterior border slightly tawny; subcostal cell dark grey. Halteres pale yellow. Tegulae whitish, with tawny edges and a little yellow hair.

Described from a unique ♂ in my own collection, sent by Mr. E. Green, taken at Kandy (Ceylon), December 1907. The specimen is perfect, except for the missing antennæ. At first I thought it was the ♂ of my *sexfasciatum*, but am now convinced it is quite distinct. The three colours in the abdomen stand out very clearly.

### MICRODON, Mg.

Six species are given in V. d. Wulp's catalogue; to which are added the following:—

**M. obscurus**, V. d. Wulp, 1898, Termés. Füzet., xxi, 421; Papua.

**M. metallicus**, Meijere, 1904, Bijd. Dierk., xviii, 98; Darjiling.

**M. annandalei**, mihi, sp. nov. (Pl. xiii, fig. 10.)

♂. Nepal (Soondrijal). Long.  $9\frac{1}{2}$  mm.

*Head* black; frons narrowed just above antennæ, covered with close silver-white hair, only visible from above; vertex

black; antennæ black; 3rd joint one-and-a-half times as long as 2nd, or as long as 1st and 2nd together. Under side of head black, eyes bare, very shining and smooth.

*Thorax* black, with very sparse gold-grey hair towards the posterior part, seen best from behind; scutellum similar, with a slight indentation in centre of posterior border.

*Abdomen* and belly uniformly brick-red, with traces of minute whitish pubescence on posterior half; base of 1st segment black.

*Legs* black, with fine silvery white hair on coxæ and outside of tibiæ.

*Wings* pale blackish.

Described from one ♂, the type, in the Indian Museum collection.

I have much pleasure in naming this handsome species after the Superintendent of the Indian Museum, at whose hands I have received so much assistance and consideration in my study of Oriental Diptera.

***M. cæruleus*, mihi, sp. nov.**

♀. Assam (Margherita). Long. 5 mm.

Frons shining black with very sparse and short yellowish hair; vertex forming a slightly raised triangle reaching almost to the base of the antennæ, which are blackish brown. 3rd joint a little flattened, three or four times as long as 2nd, 1st much shorter than 3rd; mouth-border pale.

*Thorax* (much broken) violet-black; scutellum likewise, with two short blunt but distinct spines.

*Abdomen* deep violet-black, posterior borders of segments and tip of abdomen with whitish hair.

*Legs* bright tawny red, base of fore femora brown, middle femora and tibiæ brownish grey, base of hind femora and apical half of posterior tibiæ brown.

*Wings* pale grey, the recurrent portions of 4th and 5th longitudinal veins almost straight.

Described from above type, which is in the Indian Museum.

***M. flavipes*, mihi, sp. nov.**

♀. Lower Burma. Long.  $7\frac{1}{2}$  mm.

Frons and vertex blackish, the former with dense gold-yellow hair, only visible from above; eyes bare, shining, bright brown, antennæ and antennal stem brown, 3rd joint twice as long as 2nd; 1st as long as 2nd and 3rd together.

*Thorax* brown, dorsum black, with gold hair; scutellum black, with gold hair.

*Abdomen* brown with gold pubescence, which is very minute on 1st three segments, seen only from in front, and forming a gold spot extending over the edges at the sides of the 3rd and 4th

segments. Two broad gold hair spots, meeting towards the apex of the abdomen, form a V.

*Legs* entirely bright tawny, with minute silver-yellow pubescence on outside of tibiae and tarsi.

*Wings* quite clear, 4th longitudinal vein quite straight on the recurrent portion.

Described from four ♀ ♀ (including type) from Mergui in the Indian Museum collection.

**M. ruficaudus**, mihi, sp. nov. (Pl. xiii, fig. 11.)

♀. Calcutta. Long. 14 mm.

Entire face above and below antennae ferruginous red, with short tawny hair; frons one-fourth width of head; ocelli very close together; antennae tawny red, 3rd joint brownish black. Eyes bare, shining, facets very small.

*Thorax* blackish, with fiery red ferruginous hair; scutellum similar.

*Abdomen* obconical, distinctly longer than thorax; basal half black; apical half tawny red with short golden red hair. Belly bare, basal half black, apical half red.

*Legs* ferruginous red, practically bare; coxae, a streak at base below middle femora, hind femora wholly except tip, and a spot on outer side of hind tibiae at tip, black.

*Wings* tawny yellow. Halteres tawny.

Described from the one ♀ taken by me in Calcutta, 26-ix-04. Type in my collection.

**M. apicalis**, V. d. Wulp.

As the specific name *apicalis* has been used in this genus I propose *wulpii* for this species.

**M. auricinctus**, mihi, sp. nov.

♀. Ceylon. Long. 13 mm.

This species bears considerable resemblance to my *ruficaudus*, its differences being as follows:—

The antennae are black, except the dark red basal half of the 1st joint. The hair on the face is thick, golden yellow. Metanotum shining black. The 2nd abdominal segment is black in the centre, and ferruginous red towards the sides; nearly the whole segment, including the posterior border, being covered with short, fiery golden-reddish tomentose hair. 2nd segment black; a stripe of short bright golden hair across the base, continued downwards over the edge, and along the sides, below. A stripe also of similar hair on the posterior border, also carried over the edge to the under side. 4th segment, wholly ferruginous red, nearly bare, except for a little concolorous hair at tip.

Fore coxæ tawny, posterior coxæ blackish, all coxæ with bright short golden yellow hair. Remainder of legs wholly bright tawny red, unmarked.

*Wings* dark grey, distinctly blackish at tip and bright yellowish tawny from the anterior border down to the *vena spuria*, this colour extending distally to a little beyond the end of the upper basal cell.

Described from a perfect unique example sent me by Mr. E. Green, taken at Kandy in October 1907. In my collection.

The full list of Oriental species will now stand thus—

1. **stilboides**, Wlk., 1849, List Dip. Br. Mus., ii, 538; East India.
2. **indicus**, Dol., 1857, Nat. Tijds. Ned. Ind., xiv, 404 (*Ceratomyia*); Amboina.
3. **fulvicornis**, Wlk., 1859, Pr. Linn. Soc. Lond, iii, 94; Aru Islands.
4. **apicalis**, Wlk., 1859, Pr. Linn. Soc. Lond, iii, 94; Aru Islands.
5. **sumatranus**, Wulp, 1892, Dipt. Sum. Exp., 29; Sumatra.
6. **wulpii**, Wulp, 1892 (change of name from *apicalis*, V. d. Wulp), Dipt. Sum. Exp., 29; Sumatra.
7. **obscurus**, Wulp, 1898, Termés. Füzet., xxi, 421; Papua.
8. **metallicus**, Meijere, 1904, Bijdr. Dierk., xviii, 98; Darjiling.
9. **annandalei**, mihi, sp. nov., ♂; Nepal.
10. **cæruleus**, mihi, sp. nov., ♀; Assam.
11. **flavipes**, mihi, sp. nov., ♀; Assam.
12. **ruficaudus**, mihi, sp. nov., ♀; Calcutta.
13. **auricinctus**, mihi, sp. nov., ♀; Ceylon.

### CERIA, F.

To the six species of this genus given in V. d. Wulp's catalogue, are to be added five others, two being described recently, and three of mine described below.

**C. metallina**, V. d. Wulp, 1898, Termés. Füzet., xxi, 420; Papua.

**C. trinotata**, Meijere, 1904, Bijdr. Dierk., xviii, 97; Darjiling.

**C. obscura**, mihi, sp. nov. (Pl. xiii, fig. 12.)

♀. Sikkim. Long.  $12\frac{1}{2}$  mm.

Frons and vertex all black; a yellow thin V-mark below antennæ, which are all black, the three joints being about equal in length, and the antennal stem a little longer than the 1st joint.

*Thorax* dull black, humeral calli tawny; scutellum black, the posterior edge narrowly yellow.

*Abdomen* black; basal three-fourths of the contracted 2nd segment brown; posterior borders of 2nd and 3rd segments narrowly yellow; 4th with a distinctly wider black border; 5th black, small.

*Legs* all dark brown, the outer sides of the tarsi with a little grey pubescence.

*Wings* grey, dark brown from the costal border; the colour extending over both basal cells, and to about half way between the 3rd and 4th longitudinal veins, and reaching to the wing-tip at the termination of these two veins. The lower half of the discal cell is thus clear.

Described from one ♀ in the Indian Museum collection, from Sikkim.

**C. compacta**, mihi, sp. nov. (Pl. xiii, fig. 13.)

♀. Lower Himalayas (Mussoorie). Long.  $11\frac{1}{2}$  mm.

Vertex broadly black, also a wide stripe below antennæ and lower part of face and a transverse line just below the vertical black spot; rest of face red, antennal protuberance reddish brown, antennæ dark brown, 3rd joint nearly black. A little white hair behind the eyes and on lower part of head.

*Thorax* all black except red shoulder spots and a vertical red stripe each side of the thorax a little in front of the wings; scutellum entirely red.

*Abdomen* black, dull, posterior edges of 2nd, 3rd and 4th segments with a thick but narrow red border.

*Legs* red; coxæ, a narrow ring at the base of the four anterior femora, and extending to about two-thirds on the hind femora (extreme base red), and a narrow, somewhat interrupted ring on apical half of all the tibiæ, black.

*Wings* clear; brown from fore border to just beyond the 3rd longitudinal vein and including the whole of the lower basal cell. Halteres yellowish red.

Described from one ♀ taken by me at Mussoorie, 22-vi-05. In my collection.

**C. apicata**, mihi, sp. nov.

(*Id. id.*, Bigot, *nom. nud.*)

♂. South India. Long. 18 mm.

*Head*: face wholly bright orange-yellow, bare; cheeks and mouth with a raspberry-red tinge. Antennæ raspberry-red, the apical half of 3rd antennal joint yellowish grey. Vertex narrowly yellow, ocellar elevation small, reddish. Proboscis and palpi black. Eyes dark bronze-brown. Back of head yellow.

*Thorax* reddish brown, bare. Humeral and præalar calli orange-yellow. Meso-, ptero- and sternopleuræ, brownish yellow. Scutellum and metanotum red-brown; posterior border of scutellum yellow.

*Abdomen* reddish brown, with very minute pubescence. Posterior border of 2nd segment narrowly yellow, a wider yellow border on the 3rd segment, widening at the sides; 4th segment

yellow, narrowly dark red-brown at base, and with a thick yellow posterior border, narrowest in the centre, and widened and extended forwards along the sides. Genitals raspberry-brown.

*Legs* red-brown; a yellow streak on the under side of fore pair, and the basal half of hind femora yellow.

*Wings* clear; basal half of costa yellowish, also base of wing; a blackish spot at the tip, limited posteriorly by the 4th longitudinal vein. Anal vein suffused with yellow, as far as the cross-vein. Halteres small, blackish.

Described from a ♂ in the Indian Museum collection taken at Ganjam (Madras Presidency). One of each pair of legs is missing: the species appears quite a distinct one.

Of the previously described species, *C. eumenoides*, Saunders, is represented in the Indian Museum collection by two ♀ ♀ (one from Calcutta), and *C. javana*, Wied., by a pair from Tenasserim.

A specimen from the Naga Hills in the collection, labelled *C. vittigera*, Big., is only *C. javana*, Wied., the former name being a *nomen nudum*.



X.—DESCRIPTION OF A NEW VARIETY OF  
*SPONGILLA LORICATA*, WELTNER.

By R. KIRKPATRICK.

(Plate ix.)

Among the unnamed and undescribed specimens of freshwater sponges in the collection of the Natural History Museum, London, is a very fine example from Burma, belonging to *Spongilla loricata*, Weltner, but representing a new variety of that species. Weltner, who described the species in 1895 (*Archiv. Naturg.*, 61st year, bd. 1, p. 138), had only very scanty material to work with, *viz.*, a few gemmules on shells of *Ætheria* from an unknown locality in Africa; some of the larger skeletal spicules were adhering to the gemmules, but none of the body of the sponge remained. Consequently it would be well to give a fuller description of the sponge from the abundant material now available; and, further, as Dr. Annandale, Superintendent of the Indian Museum, is bringing out a monograph of the freshwater sponges of India, it is desirable to describe the specimen without further delay, so that the information may be incorporated in that work.

I have to thank Professor Dr. Weltner for his courtesy in sending me two micro-slide preparations of the gemmules of the type-specimen.

*Spongilla loricata*, Weltner, var. *burmanica*, var. nov.

1895, *Spongilla loricata*, Weltner, *Archiv. für Naturgeschichte*, 61st year, band i, p. 138.

The specimen consists of seven firm, hard, thin slabs about 7·5 mm. thick and of a pale brown colour; when joined together, the pieces cover an area of a square foot. Mr. E. W. Oates, who collected and presented the sponge, writes that the specimen was found encrusting the vertical and horizontal surfaces of the bottom beam of a lock gate, where it covered an area of six square feet. The beam had been tarred several times before the sponge was discovered.

The portion of the gate on which the sponge was growing was submerged from November to May for eight hours a day at spring tides, but was entirely dry during the six days of neap tides. From May to October it was constantly submerged. The sponge was found in April. Although the canal is subject to the tides, the water at the lock is always fresh. The colour of the sponge during life was the same as in its present condition,

*Description.*—The upper surface of the sponge is coarsely prickly and spinous, and with numerous small cylindrical chimney like oscules rising vertically above the general surface to a height of about 6 mm., the diameter at the orifice being from 2 to 2.5 mm.; the outer wall of the oscules is provided with longitudinal spinous ridges.

The spines are either single and pointed, and from 1 to 2 mm. in height, or broader, and divided only near the summit; or again they may be united into small ridges with slender prickles along the edges.

The under or encrusting surface is level; here and there are gemmules isolated or in groups; and over considerable areas is a reticulate pattern, each mesh of the reticulum having a small circular rim near its centre; these markings are formed by the front walls of the zoecia of the Polyzoon *Hislopia lacustris*, the circular rims being the orifices of the zoecia; the posterior walls of the zoecia have been left behind on the wooden beam.

The dermal membrane is firmly attached, and there is not a differentiated dermal skeleton. The dermal membrane roofs over a fine surface reticulum, the meshes of which are about .2 to .4 mm. in area; groups of these fine meshes are often sunk in concavities between groups of the larger spines; the pores are not visible.

*Skeleton.*—A thin vertical section of the crust in balsam shows vertical pillars continued up as spines. The pillars, which vary from .2 to .4 mm. in thickness, are from 1 to 2 mm. apart; they do not arise from the base, but at a point a little above the base, or even half way up; the section shows, also, traces of horizontal lines of cleavage, marking possibly stages of growth or temporary arrest of growth.

Between the vertical pillars is a fine reticulum with meshes rounded or oval in section, and about .2 to .6 mm. in diameter, the strands being about 2 to 7 spicules thick. The *gemmules* are situated in the encrusting base of the sponge. They are either single and spheroidal and about .8 mm. in diameter, or double and oval and about  $1 \times 1.3$  mm. in diameter. There are three layers—an outer shell of large smooth strongyles similar to those of the general skeletal framework, a middle layer of finely spined micro-strongyles, and a thick, inner chitinous coat; the middle layer again is divided into two—an outer one applied to the inner surface of the outer shell, and an inner one embedded in the chitinous shell.

The poral tube (fig. 5), best seen in specimens which have been desilicified with hydrofluoric acid, is nearly cylindrical and  $45 \mu$  in length.

Spicules, megascleres, strongyles (fig. 6), smooth, slightly curved, occasionally a little swollen at the ends,  $270 \times 195$  on an average; very commonly with one or more fusiform swellings.

Microscleres amphidisks (fig. 7), numerous and scattered about in the flesh,  $30-45 \mu$  long, with slender curved smooth shaft, and with 4-5 prongs to each disk.

Microstrongyles of the gemmules (fig. 8) in all sizes up to  $49 \times 7.85 \mu$ ; curved, and with surface granular owing to fine spines.

The main difference between the typical African form and the Burmese variety consists in the former having much larger microstrongyles ( $83 \times 15.7 \mu$ ) with larger and coarser spines (fig. 10); Mr. Highley's careful camera-lucida drawings show clearly the great difference in this respect. Judging from Prof. Weltner's sections of gemmules, these bodies lack the definite outer shell of smooth macrostrongyles, though this may not improbably be due to the breaking down and removal of this layer. A further difference consists in the presence, in the African specimen, of slender, finely spined strongyles (figs. 9, 9a), these being absent in the Burmese form, though perhaps this fact is not of much importance.

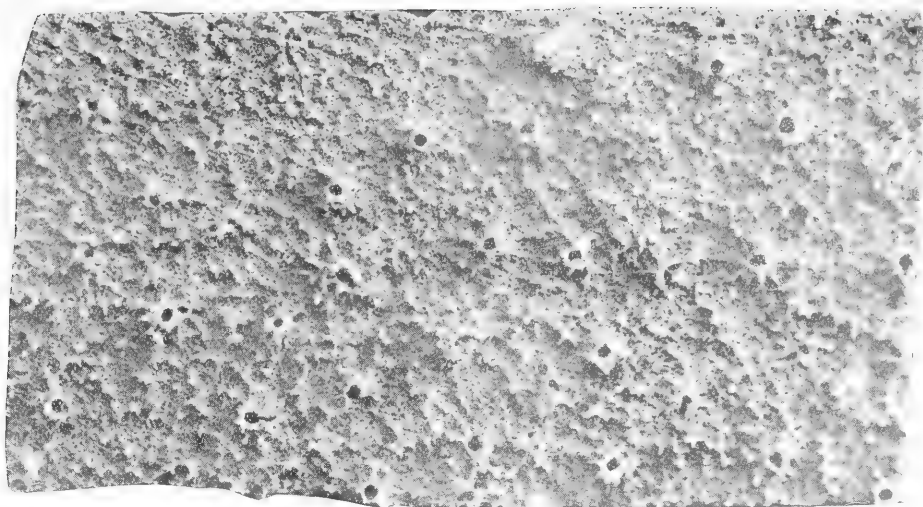
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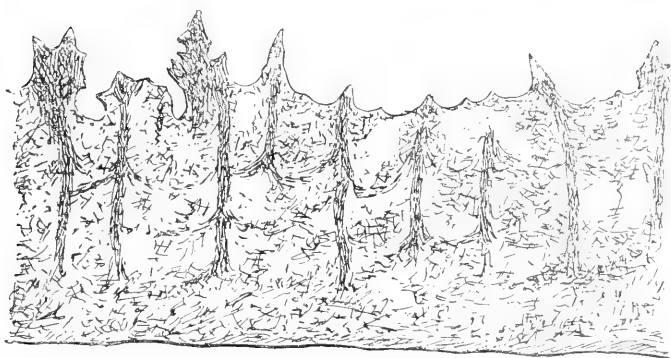


### EXPLANATION OF PLATE IX.

- FIG. 1.—A portion of the sponge. Photo., nat. size.
- FIG. 2.—Vertical section,  $\times 4$ .
- FIG. 3.—Skeletal network,  $\times 45$ .
- FIG. 4.—Gemmule,  $\times 45$ .
- FIG. 5.—Gemmule, desilicified by means of hydrofluoric acid, showing the poral tube,  $\times 45$ .
- FIG. 6.—Strongyle of skeletal framework,  $\times 250$ .
- FIG. 7.—Amphidisk,  $\times 700$ .
- FIG. 8.—Microstrongyle,  $\times 700$ .
- FIG. 9.—Strongyle with knobbed ends (amphityle), and with rough surface, from Prof. Weltner's African specimen,  $\times 250$ .
- FIG. 9a.—End of same,  $\times 425$ .
- FIG. 10.—Microstrongyle of gemmule, from Prof. Weltner's specimen,  $\times 700$ .

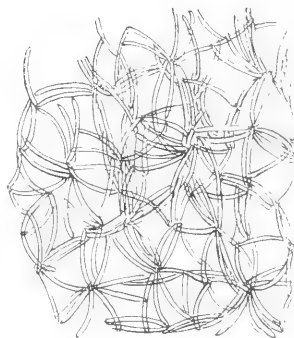


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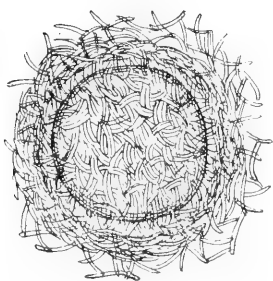
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x 4



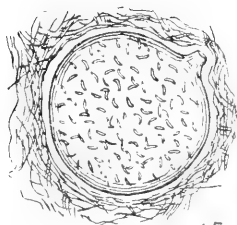
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x 45



4

x 45



5

x 45



6

x 250



9<sup>a</sup>

x 425



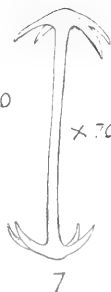
9

x 250



8

x 700



x 700

7

x 700



10





## XI.—NOTES ON ORIENTAL DIPTERA.

### V.—DESCRIPTION OF A NEW SPECIES OF PSYCHODID OF THE GENUS *PHLEBOTOMUS*.

By N. ANNANDALE, D.Sc., *Superintendent, Indian Museum.*

Several records (*opp. post. cit.*) of the existence in India of blood-sucking flies of the family Psychodidæ have been published, but no species from the Oriental region appears as yet to have been described specifically. I have therefore thought it worth while to publish a description of the form most common in Calcutta, and have drawn up, in consultation with Mr. Brunetti, a diagnosis sufficiently detailed to ensure recognition of the species, adding certain notes on the scales and bristles.

*Phlebotomus argentipes*, Annandale and Brunetti, sp. nov.

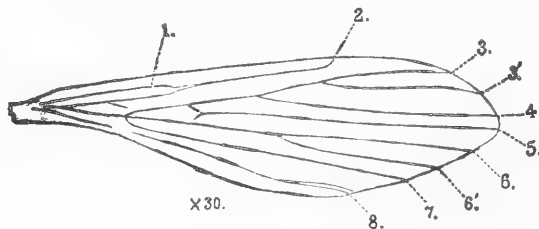
♂ ♀. Calcutta. Long. 1·5 mm.

Head (including mouth-parts), dorsum of thorax, abdomen blackish<sup>1</sup> or brown, the abdomen paler than the head and dorsum of the thorax; antennæ dark grey owing to the presence of long, flattened hairs and bearing spatulate scales on the two basal joints and on the proximal half of the first joint of the flagellum. First (basal) joint of the antenna conical, truncate distally; second joint sub-spherical, bearing a circle of about twelve slender, spatulate, curved scales and, nearer the base, a circle of alternating flattened bristles; first joint of the flagellum about four times as long as the preceding joint (*i.e.*, distal joint of the scape) and twice as long as the first of the remaining thirteen joints of the flagellum, the length of which gradually diminishes towards the tip of the antenna. Head small, eyes large, black, separated narrowly on the dorsal surface; rostrum stout, sausage-shaped; proboscis equally developed in the two sexes; the rostrum bearing several groups of upright curved bristles. Thorax tumid above, with a middorsal sulcation anteriorly, the dorsum bearing bunches of long, blackish, more or less erect, curved, flattened bristles, which are similar to those on the rostrum, but stouter, and arise from sockets provided with raised rims; these bristles exhibiting silvery reflections in certain lights. Pleuræ and sternum cream-coloured, devoid of bristles except at the base of the legs. Abdomen slender in both sexes, covered with long scattered, blackish bristles like those on the thorax but finer.

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<sup>1</sup> The exact tint of the darker part varies considerably. It is possible that individuals occur in which the head, thorax and abdomen are uniformly pale.

Legs very long, the hindermost being about three times as long as the thorax and abdomen together; femora much shorter than tibiae; metatarsi in all cases at least as long as the remaining joints of the tarsi together; legs grey with very strong reflections, which make the tibiae and tarsi appear silvery white in certain lights; femora bearing fine hairs and bristles similar to those on the abdomen but finer, also flattened spatulate scales; tibiae and tarsi covered with angularly bent scales and bearing, especially at the joints, stiff straight, slender hairs.



Wing of *Ph. argentipes* denuded of hairs and scales.

Wings<sup>1</sup> narrow, obtusely pointed at the tip, iridescent, silvery grey with a hoary fringe on the posterior border, immaculate. The fourth vein joins the third some distance in front of the apex of the upper anal cell and almost on a level with the bifurcation of the sixth vein. Ninth vein obsolete, indistinguishable from the anal furrow. Upper anal cell long and narrow; lower anal cell incomplete, its apex a considerable distance behind that of the upper cell. Cell formed by junction of first and second veins very long and narrow. Scales at base of wing only; halteres covered with scales.

Genital apparatus of the male conspicuous; the superior appendages long and stout, their distal joint bearing five long, stout, broadly arched, sickle-shaped chætæ, *viz.*, a single chæta about a third of the distance between the two ends of the joints from its base, a pair of slightly unequal chætæ near the middle of the joint, and a terminal equal pair; the ventral surface of the basal joint deeply grooved and provided with a row of stiff hairs; inferior appendages long and rather slender, bearing a large bunch of stout bristles at the tip.

*Ph. argentipes* occurs not uncommonly in Calcutta, especially during the winter months. It is nocturnal in its habits and is often found in the basements of houses. Possibly it is identical with the species figured recently by Maxwell-Lefroy,<sup>2</sup> but its legs appear to be longer. The palpi of the species figured by Giles<sup>3</sup>

<sup>1</sup> The numbering of the veins follows the diagram published by Eaton in 1893 (*Ent. Mon. Mag.* (2), iv, p. 7). It has seemed best to use numbers for the veins rather than names. Schiner numbers the veins differently, but the venation of our species agrees with his description precisely.

<sup>2</sup> *Prel. Account of the Biting Flies of India*, pl. ii, fig. 4 (1907).

<sup>3</sup> *Gnats or Mosquitoes* (second ed.), p. 5, fig. 2 (1902).

as a *Phlebotomus* do not agree with Schiner's<sup>1</sup> and with Eaton's<sup>2</sup> definition of the genus, while the "moth fly" described by Captain Franklin<sup>3</sup> appears, so far as it is possible to say, to belong to a very different genus probably allied to *Pericoma*.

#### NOTE ON THE SCALES, BRISTLES, ETC.

The scales are all very minute; two kinds can be distinguished. Those on the antennæ, palpi, halteres, extreme base of the wings and the femora have a colourless, more or less cylindrical, short base, and a flattened, more or less expanded blade of much greater length in which a grey pigment appears to be suffused. They are solid but bear on the surface a number of very minute longitudinal striations. They vary considerably in breadth and in longitudinal curvature, but are always thin and spatulate and are never bent at anything approaching an angle. The scales on the tibiæ and tarsi, on the other hand, are colourless and are bent near their middle in such a way that the two halves form or nearly form an angle with one another. Moreover, these scales contain numerous very fine longitudinal tubules full of air, which produce the silvery appearance of the parts they clothe. Both kinds of scale are usually more or less imbricate, but those on the palpi are scattered, while those on the second joint of the antennæ alternate with bristles situated nearer the base of the segment. Those on the femora, halteres and third joint of the antenna lie nearly flat, while those on the palpi and antennæ slope outwards or upwards, and are curved inwards in different degrees. The peculiar scales on the tibiæ and tarsi are arranged more or less distinctly in annular series separated by circles of stiff hairs, this arrangement being most distinct on the distal joints of the tarsi.

The "flattened bristles" to which constant reference has been made, resemble scales in several particulars when examined minutely but appear on examination with a lens or a low power of the microscope so like ordinary bristles that we have described them as such; it is difficult to draw any exact line between them and ordinary hairs. They have, however, like the scales, a short, more or less cylindrical colourless basal portion, but the distal portion is very long and only slightly flattened, always remaining relatively narrow but varying considerably in this respect. Like the blade of the scales of one type this flattened portion of the bristle apparently contains a dark pigment, but it is frequently, if not always, hollow and filled with air. Such bristles vary greatly in length and in degree of curvature. They are longest and stoutest on the thorax, to which they give an untidy, "unbrushed" appearance owing to the fact that they stand up and slope in different directions, always being more or less bent. Their sockets are

<sup>1</sup> *Fauna Austriaca*, ii, p. 630 (1864).

<sup>2</sup> *Ent. Mon. Mag.*, xl, p. 55 (1904).

<sup>3</sup> *Ind. Med. Gazette*, xli, p. 350, fig. 4 (1906).

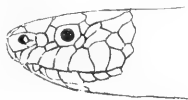
very conspicuous on the dorsum of the thorax and have pear-shaped outlines, the stalk of the pear pointing in the direction towards which the bristle that arises from it slopes. The bristles on the genital apparatus of the male appear to have similar characters, but are straight or nearly so, and arise from circular sockets. The hairs on the wings, and many of those on the body and legs, are not provided with sockets with raised rims, but there are fine bristles on nearly all parts of the body with sockets whose rims are a little raised. The chætæ of the superior appendages of the male are flattened and have a yellowish colour. They have not depressed sockets, but arise from bases more or less clearly raised and differentiated from the general surface of the appendage to which they belong. The claws on the feet are very small and inconspicuous.

## MISCELLANEA.

### REPTILES.

REMARKS ON *Simotes splendidus*.—I am indebted to Dr. N. Annandale for the privilege of examining a rare snake, *Simotes splendidus*, from Kyaukse, Upper Burma.

For many years this species was only known from a single specimen in the British Museum described by Günther in 1875.<sup>1</sup> This specimen was captured in the Wynaad. In 1900, Major (then Captain) Evans and I acquired the head and neck of a snake from Sagaing, Upper Burma, which we referred to this species with some hesitation, firstly, from the fact that there were four præfrontals in a transverse series as well as four internasals; secondly, the great distance separating the locality that produced the type-specimen, and that in which our example was obtained; and thirdly, owing to the imperfect character of this specimen. We published some remarks on this example.<sup>2</sup> Later Major Evans procured two perfect specimens of what appeared obviously the same species as that just referred to. These were both obtained in Upper Burma (the Ruby Mines and Yamethin District). These examples were remarked upon by Major Evans in the *Bombay Natural History Journal*,<sup>3</sup> and he expressed the opinion that the specimen agreed with Mr. Boulenger's description of the type-specimen.<sup>4</sup>



Head of *Simotes splendidus*, nat. size.

As Major Evans does not describe his specimens, and Upper Burma is so far removed from the Wynaad, I think a further description and figure of Dr. Annandale's lately acquired specimen may serve to clear up any doubt in identity.

<sup>1</sup> *Proc. Zool. Soc.*, 1875, p. 231, and plate xxiii.

<sup>2</sup> *Bom. Nat. Hist. Journ.*, vol. xiii, p. 537.

<sup>3</sup> Vol. xvi, p. 362.

<sup>4</sup> *Fauna Brit. Ind.*, *Reptilia*, 1890, p. 310.

Length about 2 feet (stiffened by spirit), the tail  $3\frac{1}{8}$  inches. Costals two headlengths behind head 21, midbody 21, two headlengths before vent 17. In the step from 21 to 19 the second and third rows above the ventrals coalesce on the left side, and the third disappears on the right side; in the step from 19 to 17, the fourth and fifth rows above the ventrals coalesce. The last row is not or barely enlarged. No keels and no apical pits. Ventrals: 169, angulate. Anal entire. Subcaudals: 41, divided. Rostral: in contact with eight shields, the sutures made with the anterior nasals rather largest; portion visible above equals its distance to the frontal. Internasals: four, subequal, in a transverse series, the median projected backwards so as to separate about two-thirds of the length of the præfrontals. Præfrontals: a pair; the suture between them about half the præfronto-frontal suture; in contact with median and lateral internasals, postnasal, loreal, præocular, supraocular and frontal. Frontal: touches six shields, the sutures made with the supraoculars largest, about one-third greater than those with the parietals, which are the smallest. Supraoculars: length subequal to frontal, breadth two-thirds frontal. Nasals: divided in contact with 1st and 2nd labial by equal sutures, the posterior subdivided into two superposed parts; the anterior is much the largest; the nostril occupies the upper two-thirds of the suture, the suture runs to the 2nd labial. Loreal: one, height rather exceeds length. Præoculars: two, the lower small and cuneate, wedged between the 3rd and 4th labials. Postoculars: two. Temporals: two, the lower in contact with the 6th and 7th labials. Labials: eight, the 4th and 5th touching the eye, the 6th and 7th largest, and subequal. Infralabials: five, the 5th largest, broader than the posterior sublingual and in contact with the scales posteriorly; the suture between the first about half that between the anterior sublingual fellows. Anterior sublinguals: longer than posterior. Posterior sublinguals: touching the 4th and 5th infralabials. Colour: light stone colour with sixteen large, dark dorsal marks, indented before and behind vertebally, and midcostally. In the latter region the indentations sometimes meet, and detach fragments. These marks are well defined with darker margins. A pale vertebral streak, and a pale vertebral supracaudal streak. Head obscurely mottled above. Belly whitish with somewhat obscure, lateral, dark roundish spots with a tendency to be distributed on alternate ventrals. Tail beneath whitish, unspotted.

It is very unusual for the suture from the nostril to run to the 2nd-labial in land snakes. It does so in the genus *Callophis*, but I cannot recall another instance. In the sea snakes (*Hydrophiidæ*) it is the rule, and has very few exceptions.

The head was badly damaged, so that the head outlines may be somewhat faulty, but the relationship of shields is accurate.

## INSECTS.

CORRECTIONS TO NO. IV (*Limnophora* AND *Anthomyia*) OF "NOTES ON ORIENTAL DIPTERA" (*Rec. Ind. Mus.*, i, p. 381).—My *Limnophora himalayensis*, described on p. 381 of the first volume of these Records, is a *Spilogaster*, the arista being distinctly, though rather shortly, plumose. The figures 3 and 3a in pl. xv (*loc. cit.*) become incorrect, in consequence of the omission of this character.

A second error of mine occurs in the description of *Anthomyia bisetosa*, Thoms., in which the arista is stated to be bare, whereas it is shortly pilose, as described by the author. Figures 4, 4a, 5 and 5a become correspondingly incorrect.

The new Palæarctic Catalogue confirms the synonymy of *Anthomyia lobalis*, Thoms., with *Limnophora tonitruui*, Wied. (*Anthomyia id.*). *Anthomyia illocata*, Wlk., is retained in that genus in the new Catalogue.

E. BRUNETTI.

## CRUSTACEA.

A NOTE ON THE ISOPOD GENUS *Tachæa*.—When lately describing *Tachæa spongillicola*, sp. nov., an Isopod found by Dr. Annandale in the canals of a freshwater sponge at Calcutta (*Journ. Linn. Soc. London*, vol. xxx, p. 39, 1907), I unfortunately omitted from the list of known species of the same genus all mention of *Tachæa lacustris*, Max Weber, published in 1892 (*Zool. Ergebn. einer Reise in Nederl. Ost. Ind.*, vol. ii, p. 551). Professor Max Weber has now very kindly given me the opportunity of comparing his species with my own, and agrees with me in thinking them distinct, though closely related. His species has the seventh joint of the maxillipeds distinct, and the sixth joint of the first gnathopods long and narrow. It was taken in Sumatra, from the Lake of Singkarak, at a height of 362 metres above the sea, where it lodged, together with *Rocinela typus*, Milne Edwards, on the skin of various Cyprinoids.

T. R. R. STEBBING.

THE HABITS OF THE AMPHIPOD *Quadrivisio bengalensis*, STEBBING.—This interesting species is very abundant in the brackish ponds at Port Canning. An active swimmer, it shelters itself during the cold weather among grass-roots overgrown with sponges and amidst the filaments of green algæ, while in summer it buries itself in the mud at the bottom of the ponds, from which, however, it is very easily aroused.

As regards oviposition, which takes place in winter, it is gregarious, a favourite nursery for the eggs being the cavities in living sponges (*Spongilla alba*, Carter), in which several individuals may often be found keeping joint guard over a mass of small white eggs. No nest is built.

N. ANNANDALE.

## MOLLUSCA.

NEW VARIETIES OF *Nanina berlangeri* AND *Corbicula fluminalis*, MÜLLER, FROM INDIA.—

1. *Nanina berlangeri* var. *globosa*, Schl.

*Diagnosis*.—This form differs from the type by its small size, and more globular shape.

*Dimensions*.—Specimens all about 20 mm. in height and width.

*Locality*.—Neighbourhood of Vellore (North Arcot) in the Madras Presidency [coll. mihi].

2. *Corbicula fluminalis*, Müll., var. *holstiana*, Schl.

*Diagnosis*.—This form is decidedly more arched than *Corbicula fluminalis*, of which it is certainly a variety.

The examples have a striking resemblance to *Corbicula syriaca*, Müller, which I possess from Homs (Syria), but the specimens are very large, etc.

*Locality*.—It was found in company with *Limnæa stagnalis*, Linné, at Hoti-Mardan, near Peshawar, in the North-West Frontier Province of India, by Miss Holst, M.D., in whose honour I name the form.

HANS SCHLESCH,

January 10th, 1908.

Copenhagen.

## ENTOZOA.

RECENT ADDITIONS TO THE COLLECTION OF ENTOZOA IN THE INDIAN MUSEUM.—Specimens of the following species have recently been added to the collection, and have been identified by Dr. von Linstow of Göttingen :—

## CESTODES.

*Cittotænia bursaria*, v. Linstow (*Spolia Zeylanica*, vol. iii, p. 184 ; pl. ii, figs. 39, 40), from the intestine of *Lepus ruficaudatus* ; Songara, United Provinces (R. Hodgart, Ind. Mus. Colltr.).

*Tænia polycalcaria*, v. Linstow (Centralblatt f. Bakteriöl. . . . . Infektionskrank, xxxii, p. 532 ; figs. 1-2), from the intestine of *Felis pardus* ; Dhakna Bagh, Nepal Terai (R. Hodgart, Ind. Mus. Colltr.).

*Solenophorus megaloccephalus* from the intestine of *Felis tigris* ; Oncha Gaon, United Provinces (R. Hodgart, Ind. Mus. Colltr.).

“Certainly a pseudoparasite from Python ; the tiger must have eaten a python shortly before.”



*Pterocercus* spp. (larvæ), from the mesentery of *Dendrophis pictus*, from the intestine of *Bungarus fasciatus*, from the peritoneum of *Tropidonotus piscator*, and from under the skin of *Coluber radiatus* (all collected by Major F. Wall in Assam).

“The Pterocerci are larvæ, probably of a species of *Bothriocephalus*; the sexual forms of these species in snakes are perhaps to be found in large birds of prey.”

#### NEMATODES.

*Ascaris attenuata*, Molin, from the intestine of *Python molurus*; Kichha, Naini Tal district, United Provinces (R. Hodgart, Ind. Mus. Colltr.).

*Ascaris* ? *mystax*, Rud., from the intestine of *Felis pardus*, two imperfect males; Dhakna Bagh, Nepal Terai (R. Hodgart, Ind. Mus. Colltr.).

*Ascaris* spp. (larvæ and immature forms), from the stomach of *Bungarus fasciatus* (Major F. Wall, I.M.S.), from the stomach and mesentery of *Tropidonotus piscator* (Major F. Wall, I.M.S.), from the mesentery of *Otolithus maculatus* (I. H. Burkill), and from the body cavity of *Dysalotus alcockii* from 705 fathoms (Indian Marine Survey).

*Kalicephalus willeyi*, v. Linstow (*Spolia Zeylanica*, vol. i, p. 99; pl. i, figs. 14-18), from the stomach of *Bungarus fasciatus*; Dibrugarh, Assam (Major F. Wall, I.M.S.).

#### LINGUATULIDÆ.

*Porocephalus brotali*, Thunb., from the outer wall of the stomach of *Bungarus fasciatus*; Dibrugarh, Assam (Major F. Wall, I.M.S.).

#### POLYZOA.

A SUB-FOSSIL POLYZOON FROM CALCUTTA.—In the *Records of the Geological Survey of India*, vol. xxi, p. 175, Mr. E. Vredenburg describes briefly an oyster bed discovered under one of the streets of Calcutta. Several molluscs were found in this bed, all of them belonging either to freshwater species or to species still found in brackish water in the estuaries of the Ganges. Some of the oyster shells were incrustated by a Polyzoon, which was diagnosed in the Museum as a species of *Lepralia*. A fragment was submitted through Mr. R. Kirkpatrick to Mr. A. W. Waters, who reports upon it as follows:—

“Zoarium is in places in two layers, and from the fragment it looks as though there may have been two or more layers.

Zoëcia irregularly quadrate with large pores over the surface; the zoëcia are divided by raised ridges; the aperture is surrounded by a thick border with an elevation at each side and one below the aperture. Triangular avicularium to the side of the aperture, but only to a few zoëcia. Ovicell raised, globular, with a small sunk area perforated by a few large pores.

This is in many respects like *Lepralia* (*Escharoides*) *occlusa*, Busk, but the zoëcia are much smaller and the avicularia have a different shape. The oral aperture is similar in shape, but smaller. The ovicell is quite the same.

Possibly it is a marked variety of *Lepralia occlusa*, or an ancestor."

CORRECTIONS AS TO THE IDENTITY OF INDIAN PHYLACTOLÆMATA.  
—In a recent note on a *Lophopus* from the Kumaon Himalayas (*Rec. Ind. Mus.*, i, p. 145), I named it *L. lendenfeldi* var. *himalayanus*. Having now had an opportunity, thanks to the kindness of Mr. R. Kirkpatrick, of examining a co-type of Ridley's Australian species, and having found numerous examples of Hyatt's "*Pectinatella*" *carteri* in a lake in the Western Ghats of Bombay, I am convinced that the Kumaon form is not specifically identical with *L. lendenfeldi* but allied to Hyatt's species, which I still see no reason to separate from the genus *Lophopus*. Whether "*himalayanus*" is a temporary phase or a local race of the latter species it is impossible to say at present, but the statoblasts of my specimens of the Kumaon form *without* hooks are certainly mature. Another identification in my former paper on the freshwater polyzoa of India (*Journ. Asiat. Soc. Bengal*, vol. iii, No. 2, 1907, p. 88) proves to be incorrect, viz., that of *Plumatella repens* of Linné. What exactly was the form originally so named is a little uncertain, but it is impossible to regard as absolutely trustworthy any identification in the genus *Plumatella* that is not vouched for in Allman's monograph (1856), unless the species has been described since that date. In any case, the common species in Calcutta is not, as I formerly thought, what Allman calls *P. repens*, Linn., but *P. fruticosa*, Allman, which Kraepelin regards as a variety of his own *P. princeps*, but which seems to me to be a constant and distinct form worthy of specific rank. I have not found the true *P. repens* according to Allman as yet in India. The examination of a considerable number of European specimens, which I owe to the kindness of Dr. F. Harmer and Messrs. R. Kirkpatrick, W. Evans and C. F. Rousselet, and of a great deal of Indian material collected by myself at different seasons and in different conditions, convinces me that a safe distinction between the two forms may be based not only on the proportions of the statoblast but also on the shape of the stomach, a feature well shown in Allman's beautiful plates. *P. fruticosa* occasionally enters into an "*Alcyonella*" phase in Calcutta, and changes into Allman's *P. coralloides* when surrounded by a freshwater sponge.

N. ANNANDALE.

## PROTOZOA.

NOTES ON A PECULIAR FORM OF *Euglena*.—This animalcule occurs in large numbers in the tank at the Shálámár Gardens, Lahore. It forms a continuous layer on the surface of the water, giving it a deep red to greenish colour. In places exposed to direct sunlight the colour is usually deep red, while in shady places it is greenish.

The animal is characterised by the presence of numerous deep red granules in the whole of the body. The granules are quite distinct from the endoplasm, and, if the body of the animal is ruptured by a slight pressure on the coverslip, they are scattered about in all directions. They are in all respects like the eye-like pigment-spot, but smaller in size. It is difficult to see the inner structure of the animal clearly on account of the presence of these granules.

Examined with the  $\frac{1}{12}$ -in. oil immersion lens, the ectoplasm is seen to be striated at the margins obliquely, but the ordinary magnification does not show these striations. The green colour of the endoplasm can usually be seen without any difficulty in the living animal, but it can be seen much more easily if the body be ruptured by pressure, when the endoplasm comes out in the form of small, round, uniformly green globules, and the red granules and the paramylum bodies are scattered about.

In the free-swimming condition the animal is highly plastic, assuming various shapes very rapidly. In its elongated state it is generally cylindrical (sometimes oval owing to the posterior part being larger than the anterior) ending posteriorly rather abruptly in a small tail-like process which is generally hyaline, but may be coloured like the rest of the body. The anterior extremity is bilabiate, one tip being larger than the other. The flagellum arises out of the mouth and is equal in length to the length of the body. The body in the elongated state is  $\frac{1}{400}$  to  $\frac{1}{200}$  of an inch long, the breadth being one-fourth of the length. The large bright red eye-like pigment-spot is situated anteriorly a little behind the mouth. The vacuole is close to the pigment-spot, a little behind and to one side. The paramylum bodies are numerous and of various sizes. The largest have the size and shape of human red corpuscles. They are biconcave or flat round or slightly oblong bodies. The endoplast is very indistinct on account of the red granules.

When the flagellum is present the animal moves forward very rapidly, but when it is lost, as is frequently the case, the forward movements are very slow. The euglenoid movements in both cases are very active.

In the encysted condition this animal resembles *Euglena tuba*, Carter, very greatly, the encysted form being like a flask. It differs from that species, however, in that it does not form any mucilaginous network, in the tubular meshes of which that animal is met with. The Lahore *Euglena* forms a flat homogeneous layer

on the surface of the water. The neck of the flask-like cyst, moreover, is never so long as in *Euglena tuba*.

In the description of *Euglena tuba* given in Saville Kent's *Manual of Infusoria* (part iii, page 385), it is stated that the motile and the encysted forms were not observed together, and that on account of the peculiar shape of the encysted form it was doubtful if the two forms belonged to one and the same animal. I do not know if the two forms have been seen together since then, but in the present species the motile animals were seen many times by the writer coming out of the temporary encystment. In fact, empty round or flask-shaped bodies can always be seen lying here and there near the free-swimming animals, and the escape of the animals can be easily observed by keeping the water containing them for a few hours in a closed vessel. The animals may come out of the encystment while it is round, or may come out when it has assumed the flask-shaped form. In the latter case, the animal never comes out through the mouth of the flask, nor has it ever been seen by the writer coming out of the side opposite the mouth; it appears always to get out laterally. The wall is ruptured on one side and the anterior end of the animal with a small flagellum projects forward. Gradually the whole animal passes through the opening. For a short time after coming out of the encystment the movements of the animal are very slow. At one time during the escape of the animal, it appears to be divided into two equal halves by a constriction in the middle caused by the narrow opening. In three or four minutes the whole animal is out. The mouth of the flask is always striated, but the neck and the body are quite homogeneous and transparent.

When the encysted animal is exposed to bright daylight, the red granules come to the surface, and thus the individual animal and the whole surface of the water have a deep red colour. In shady places the red pigment is collected at one end of the body and the remaining part is perfectly green, and the colour of the water, therefore, is greenish.

The animal greatly resembles *Euglena tuba*, Carter. The chief points in which it differs from the latter are—

1. The presence of the red granules.
2. The absence of network in the encysted condition.
3. The smaller length of the flagellum.
4. The smaller length of the neck.

SHIV RAM KASHYOP, B.Sc.

Assistant Professor of Biology,  
Govt. College, Lahore.

## XII.—GORDIENS DU MUSÉE INDIEN.

Par LORENZO CAMERANO, Professeur à l'Université de Turin.

Monsieur N. Annandale, Superintendant du Musée d'Histoire Naturelle Indien de Calcutta, a eu l'obligeance de me soumettre la collection de Gordiens appartenant au Musée. L'étude de cette collection sera certainement utile pour la connaissance de la distribution géographique de plusieurs espèces déjà connues et elle fera connaître aussi quelques espèces nouvelles pour la science.

### *Chordodes siamensis*, Camer.

Assam : J. Macdonald.

♂ Longueur maxima, m. 0.148. Largeur maxima, m. 0.001.

Exemplaire trouvé dans une "*Mantis*."

L'animal est noir.

Pegu.

♀ Longueur maxima, m. 0.302. Largeur maxima, m. 0.0015.

L'animal est d'un brun clair.

J'ai décrit cette espèce d'après un exemplaire femelle du Siam ("Nuove specie di Gordii del Basso Siam," *Bol. dei Musei di Zool. e. Anat. Comp. di Torino*, vol. xviii, n. 437, 1903). Je décris le mâle de cette espèce, qui n'a pas encore été décrit. La forme générale du corps, de l'extrémité antérieure et de l'extrémité postérieure est celle qui caractérise les espèces du genre *Chordodes*. L'animal est noir. La couche cuticulaire extérieure a la même structure que celle de la femelle.

### *Chordodes annandalei*, sp. nov.

Chitlong, Nepal : Museum Collector (Hodgart). x-07.

♂ Longueur maxima, m. 0.085. Largeur maxima, m. 0.0005.

♂       "       "       m. 0.090.       "       "       m. 0.0005.

♀       "       "       m. 0.138.       "       "       m. 0.0007.

Ces trois exemplaires ont été trouvés dans un individu de "*Mantis*."

Le corps de la femelle est de couleur brune, celui du mâle est de couleur brun-noirâtre.

La forme générale du corps, est celle qui caractérise les espèces du genre *Chordodes*. Chez le mâle, l'extrémité postérieure est entière avec un très petit sillon terminal antéro-postérieur. La couche cuticulaire extérieure du mâle a la même structure que celle de la femelle. Les aréoles papillaires sont d'une seule qualité.

Elles sont coniques, très rapprochées entre elles et souvent elles sont pourvues de formations en forme de très petits poils réfringents. La longueur des aréoles papillaires est 10—15  $\mu$  : la largeur est 3—4—5  $\mu$ .

Pour ce qui est du système des aréoles papillaires de la couche cuticulaire extérieure cette espèce appartient au groupe d'espèces du genre *Chordodes* qui ont une seule qualité d'aréoles papillaires, telles que : *Ch. moluccanus*, Roemer, *Ch. liguligerus*, Roemer, *Ch. weberi*, Villot. Elle diffère de *Ch. liguligerus* par les caractères de la couche extérieure de la cuticule. Dans cette espèce les aréoles cuticulaires sont très longues, *liguliformes* (long. 30—36  $\mu$ ). Elle diffère de *Ch. moluccanus*, qui présente les aréoles papillaires basses, arrondies, et avec une surface bouslée.

Elle diffère enfin de *Ch. weberi*, qui présente les aréoles papillaires aplaties ou arrondies.

*Chordodes giglio-tosi*, sp. nov.

Purneah, N. Bengal : W. Shillingford.

♀ Longueur maxima, m. 0.355. Largeur maxima, m. 0.001.

La forme générale du corps, de l'extrémité antérieure et de l'extrémité postérieure est celle qui caractérise les espèces du genre *Chordodes*. L'animal est brun.

La couche cuticulaire extérieure présente deux sortes d'aréoles papillaires. Les aréoles papillaires de la première sorte sont légèrement relevées, un peu arrondies et plus basses que les suivantes. Elles sont couvertes de granulations très fines.

Les aréoles de la deuxième sorte sont plus grosses, plus convexes et sont pourvues d'un prolongement clair en forme de tube un peu conique et légèrement recourbé. Ces aréoles sont disposées çà et là, isolées ou quelquefois rapprochées entre elles deux à deux.

Les aréoles de la deuxième sorte ont à leur base 10  $\mu$  de largeur environ. Les tubes ont une longueur de 12—15  $\mu$  environ, et un diamètre transversal de 2—3  $\mu$  environ.

Cette espèce est bien caractérisée par la structure de sa cuticule extérieure.

*Parachordodes pustulosus*, Baird.

Yarkand : F. Stoliczka.

Un exemplaire ♀.

Longueur maxima, m. 0.12. Largeur maxima, m. 0.0008.

Couleur jaune clair.

Cette espèce est très répandue. Elle se trouve en Angleterre, France, Allemagne, Italie, dans le désert des Kirgisi, dans la Chine méridionale et en plusieurs localités de l'Asie Centrale. L'expédition Russe au Tibet (1899—1901) l'a trouvée à Entok-gomba dans une source près du fleuve Dza-Eju (Bassin du Fleuve Bleu).

Confr. I. Camerano, "Monografia dei Gordii," *Mem. R. Accad. Scienze Torino*, ser. ii, vol. xlvii (1897); "Gordiens nouveaux ou

peu connus du Musée Zoologique de l'Acad. Imp. *Petersb.*, Sc. St. Pétersbourg," *Annuaire du Mus. Zool. Acad. Imp. St. Pétersb.*, t. i (1896), pg. 117-125, et t. viii (1903), pg. 22-29.

*Gordius fulgur*, Baird.

Tavoy : Dr. Forster.

♂ Longueur maxima, m. 0.76. Largeur maxima, m. 0.001.

♀ " " m. 1.18 " " m. 0.001.

Le corps est de couleur jaune clair. Le collier noir est à peine marqué. Le corps de la femelle est luisant : celui de mâle est moins bien conservé. Les lobes de l'extrémité postérieure du mâle sont courts et arrondis à l'extrémité. La lame postcloacale est grande et arrondie.

Andamans : D. A. de Roepstorff.

♀ Longueur maxima, m. 0.72. Largeur maxima, m. 0.001.

Le corps est de couleur jaune-brun. Le collier noir n'est pas marqué.

Je rapporte cet exemplaire avec quelques doutes au *G. fulgur*, Baird. A cette espèce il ressemble par sa longueur. On sait d'autre part que la détermination spécifique des femelles des espèces du genre *Gordius* qui ont la couche cuticulaire extérieure lisse est souvent très difficile.

Le *Gordius fulgur* est l'espèce qui peut présenter la plus grande longueur que l'on connaisse chez les Gordiens. On l'a signalée dans les localités suivantes : Batjan, Celebes, Nepal, Japan, Birmanie.

*Gordius doriae*, Camer.

Bagracote, Siliguri, N. Bengal : W. Shillingford. 4-i-83.

♂ Longueur maxima, m. 0.63. Largeur maxima, m. 0.0015.

Le corps est de couleur jaune-brun. Le collier noir est bien marqué : les bandes longitudinales brunes sont au contraire peu marquées.

♀ Longueur maxima, m. 0.36. Largeur maxima, m. 0.002.

Le corps est de couleur jaune-brun. Le collier noir est bien marqué. Il n'y a pas de bandes longitudinales brunes.

Birch Hill, Darjiling : Dr. E. Birch. 20-xii-81.

♀ Longueur maxima, m. 0.215. Largeur maxima, m. 0.0017.

Le corps est de couleur brun. Le collier noir est bien marqué. Il n'y a pas de bandes longitudinales brunes.

Darjiling : Col. A. A. A. Kinloch. 12-ix-85.

♂ Longueur maxima, m. 0.365. Largeur maxima, m. 0.0015.

Le corps est de couleur jaune-brun clair. Le collier noir et les bandes longitudinales sont peu marqués.

Darjiling.

♂ Longueur maxima, m. 0.30. Largeur maxima, m. 0.0008.

Le corps est de couleur jaunâtre. Le collier et les bandes longitudinales sont assez foncés.

Pegu.

♂ Longueur maxima, m. 0.33. Largeur maxima, m. 0.001.  
 ♀ „ „ m. 0.46. „ „ m. 0.001.

Le corps est de couleur jaunâtre. Le collier et les bandes longitudinales sont peu foncés.

Cette espèce a été signalée à Cobapo (Birmanie) et à Perak (Malacca).

*Confr.* L. Camerano, "Monografia dei Gordii," *Mem. R. Accad. Sc. Torino*, ser. ii, vol. xlvii (1897); "Gordii della Malasia e del Messica," *Ath. Accad. Scienze Torino*, vol. xxxiv, 1899.

*Gordius paronæ*, Camer.

Darjiling : D. Paterson.

♂ Longueur maxima, m. 0.37. Largeur maxima, m. 0.001.

Le corps est de couleur brun. Il n'y a pas de collier noir et de bandes longitudinales brunes. Les lobes de l'extrémité postérieure sont plus clairs en dessous. L'extrémité antérieure est blanchâtre.

Sikkim.

♀ Longueur maxima, m. 0.43. Largeur maxima, m. 0.0015.

Le corps est de couleur brun-foncé. Le collier noir et les bandes longitudinales brunes manquent.

Asiatic Society of Bengal (sans localité).

♀ Longueur maxima, m. 0.385. Largeur maxima, m. 0.0015.

Couleur du corps, collier et bandes longitudinales comme dans l'individu de Sikkim.

Tura, Garo Hills : Williamson.

♀ Longueur maxima, m. 0.30. Largeur maxima, m. 0.0015.

Couleur du corps, collier et bandes longitudinales comme dans l'individu de Sikkim.

? India (sans localité précise).

♀ Longueur, m. 0.385 à m. 0.635. Largeur, m. 0.001 à m. 0.0015.

♂ Longueur, m. 0.232 à m. 0.275. Largeur, m. 0.0008 à m. 0.001.  
 Nombreux exemplaires.

La couleur du corps est brun-noir.

J'ai décrit cette espèce d'après des exemplaires de Kota Bharu (Siam). Elle est très variable par sa longueur et par sa coloration. Les exemplaires en bon état de conservation et avec une coloration foncée sont quelque peu iridescents.



*Gordius zavattarii*, sp. nov.

Darjiling.

♂ Longueur maxima, m. 0.295. Largeur maxima, m. 0.0006.

Coloration générale jaune clair. Collier noir bien marqué. Bandes longitudinales noirâtres. Les lobes de l'extrémité postérieure sont longs m. 0.0005 environ, arrondie à leur extrémité, peu divergents. La lame postcloacale est bien développée, noirâtre et presque recourbée en ogive.

La couche cuticulaire extérieure n'est pas aréolée et présente de très petites formations réfringentes (long. 3—4  $\mu$ ) disposées çà et là et presque toujours au milieu des espaces en losange qui sont limités par les lignes croisées caractéristiques de la cuticule des espèces du genre *Gordius*.

Cette espèce a quelque ressemblance avec le *Gordius aëneus*, Villot (de Venezuela), pour ce qui est de la structure de la cuticule : mais elle en diffère par l'absence du collier noir et par la forme de la lame postcloacale.

*Paragordius* sp. ?

Darjiling Water-Works: Chairman, Darjiling Municipality.

Un exemplaire ♂ en mauvais état de conservation.



### XIII.—THE FAUNA OF BRACKISH PONDS AT PORT CANNING, LOWER BENGAL.

#### PART IX.—A NEW SPECIES OF AMPHIPODA.

By the Rev. THOMAS R. R. STEBBING, M.A., F.R.S., F.L.S., F.Z.S.

In the year 1904 Professor Coutière defined a new genus of Amphipoda, with description and figures of the typical species, *Grandidierella mahafalensis*. The specimens described had been collected two or three years earlier by Mons. G. Grandidier in Madagascar. They came from the Lake Tsimanampetsotsa in a previously unexplored region of the Mahafaly country. The lake in question is a long lagoon-like depression between latitude  $24^{\circ}$  and  $24^{\circ}30'$  S. and in longitude  $44^{\circ}$  E., about six miles from the west coast, and no longer possessing communication with the sea. Its salinity, varying with the rainfall, is greater than that of the sea during the dry season, and its fauna appears to be very poor (Coutière, *loc. cit. infra*).

Professor Coutière expressed an expectation that marine examples of his singular new species would be forthcoming on the west coast of Madagascar. This discovery has apparently not yet been made, but what has actually happened is perhaps of even greater interest. For the species about to be described, from brackish ponds in Lower Bengal, displays the very closest relationship to the one so recently found in a salt lake of Madagascar. Their differences may be considered to prove that the two species have been for a long time isolated one from the other. Yet, whatever the interval in chronology, the vast intervening space of ocean has left unobliterated and in fact unobscured the evidence of a common ancestry.

That the two species have become clearly distinct will presently be shown by characters of the antennæ, upper lip, mandibles, and gnathopods. Mons. Coutière has, in an interesting manner, compared his genus and species with *Dryopoides*, Stebbing; *Unciola*, Say.; *Chevreuxius grandimanus*, Bouvier; and *Camacho bathyplous*, Stebbing. The last-named species, reported in the "Challenger" dredgings to have come from a depth of 1,100 fathoms, has since been dredged off South Africa in 47 fathoms.

#### Fam. COROPHIIDÆ.

1906. *Corophiidæ*, Stebbing, *Das Tierreich*, "Amphipoda Gammaridea," Lieferung 21, pp. 662, 739.

In the key to the genera of this family supplied under the foregoing reference, M. Coutière's genus, with which we are

here concerned, will stand near to *Unciola*, Say. It is, however, more closely allied to *Chevreuxius*, Bonnier, being at the same time sharply distinguished from that genus by the character of the second uropods, which are here biramous, not as in M. Bonnier's genus uniramous.

Gen. GRANDIDIERELLA, Coutière.

1904. *Grandidierella*, Coutière, *Bulletin de la Soc. philomathique*, ser. 9, vol. vi, p. 173.

1906. *Grandidierella*, Stebbing, *Das Tierreich*, "Amphipoda," p. 739.

The genus is defined by M. Coutière as follows:—

Body little compressed; side-plates narrow. First antennæ with the first and second joints of the peduncle elongate, the third joint short. Accessory flagellum one-jointed, very small. Second antennæ at most equal to the preceding, fourth and fifth joints of the peduncle elongate. Mandibular palp with second joint slightly longer than first, and third than second; mandibular process narrow; cutting edge dentate. Lower lip with processes of the external lobes long and conical. First maxillæ with inner plate almost obsolete, without trace of setæ; outer plate with eleven spines. Second maxillæ having the inner plate furnished with two fringes of setæ. Maxillipeds having a series of spines on the outer plate, the finger short, unguiculate. First and second gnathopods subchelate, dissimilar; the first more robust than the second, with marked sexual dimorphism affecting both size and shape. Third, fourth and fifth peræopods with second joint expanded. The fifth peræopod almost twice as long as the third. Third uropods one-branched; peduncle a little widened on the inner side, shorter than the ramus. Telson emarginate, broader than long.

The species now to be added to the genus falls excellently under the original definition. The sister species, as often happens, are much less sharply separated in the female than in the male sex; but in both sexes they show a very clear distinction.

Accessory flagellum of first antennæ  
nearly as long as first joint of primary :  
wrist in first gnathopod of male more  
than twice as long as broad . . . . *G. mahafalensis*, Coutière.

Accessory flagellum of first antennæ not  
nearly as long as first joint of primary :  
wrist in first gnathopod of male not  
nearly twice as long as broad . . . . *G. bonnieri*, sp. nov.

*Grandidierella bonnieri*, sp. nov.

(Plate vi.)

In preserved specimens the body is moderately compressed, except when the marsupium of the female is much distended with eggs. The lateral lobes of the head are rounded, carrying

the dark rounded eyes, the space between these being occupied by a large patch of dark colouring. The outlines of an undissected specimen are exceedingly difficult to make out in consequence of the numerous irregular patches of colour over the whole surface. None of the side-plates of the peræon are deep; those of the first two segments are somewhat squared with rounded corners, those of the two following are shallowly trilobed; and this appears to be the case with the sixth pair. The postero-lateral corners of the third pleon segment are rounded with a minutely produced point. The next three segments are each shorter than the third, decreasing in succession.

The first antennæ have the first joint rather stout, armed below with a spaced row of spines, two single and three in a group; the second joint is as long as the first, but much narrower; the third is less than a third part as long as the second; the flagellum is longer than the peduncle, with fifteen unequal joints in a male and eighteen in a female specimen. The accessory flagellum is microscopically small, but carrying one or two setules. This appendage is described as very small in the type species, but it is relatively so much smaller in the present that it affords a good specific character.

The second antennæ are stouter, but in both sexes shorter than the first. The first three joints are short, the next two long, subequal, longer than the first two joints of the first antennæ. The flagellum is rather shorter than the last joint of the peduncle, seemingly five-jointed in the male and four-jointed in the female, with several slightly curved spines, and perhaps a microscopical joint not included in the above enumeration. In M. Coutière's species the flagellum of the first antennæ in the male has 19—20 joints and is shorter than the peduncle, and is 16-jointed in the female; in the second antennæ of the male the flagellum is a little over half the length of the last peduncular joint, but is itself 9-jointed, a minute apical joint being included.

The upper lip in the present species has its margin evenly convex, not slightly emarginate as figured and described for *G. mahafalensis*.

The mandibles agree very nearly with M. Coutière's figures and description, except that the spine-row has only six spines on the left and five on the right mandible in the Indian species, instead of the dozen which are attributed to each mandible in the species from Madagascar. As usual, the accessory plate is more slender and less strongly dentate on the right than on the left mandible. In the generic definition M. Coutière speaks of the mandibular process as narrow, but it is not clear what part of the appendage is intended by this expression. Schiödte originally applied the expression not to the mandible itself, but to the conical prolongations of the outer lobes of the lower lip, to which M. Coutière refers in describing that organ.

The first maxillæ appear to have the inner plate here rather more distinct than in the type species, but without setæ. The

maxillipeds differ scarcely at all from those of the type species, except in having fewer spines round the apical and inner margin of the outer plates.

The most striking difference between the two species is afforded by the great first gnathopods of the male, the fifth joint or wrist in the earlier species being two and a half times longer than broad and having a narrow obtuse process on the palmar border, which is wanting to the much shorter wrist of the Indian form. Here the massive fifth joint is less than once and a half as long as broad. The hand is not long enough to reach beyond the wrist's palmar tooth, as it does in the other species, but it is distally broad enough to supply something more of a palm than that species displays. Its finger well overlaps the palmar tooth of the wrist, but to a considerably less extent than in the Madagascar form.

In the female the first gnathopod is not complexly subchelate as in the male, but simply subchelate. The hand is shorter than the wrist, with the palm rounded, a little oblique, finely denticulate, defined by a palmar spine, which is overlapped by the point of the finger. In both sexes the inner margin of the finger has some small denticles.

The second gnathopod of the male has the narrow, distally truncate, hand only a little shorter and narrower than the wrist, instead of being considerably smaller in both dimensions as in *G. mahafalensis*. The hind border of the wrist is strongly fringed with long spines. The apex of the finger reaches a little beyond the small palm. In the female the apex of the finger only reaches the end of the palm, otherwise their limbs are nearly alike in the two sexes. The branchial vesicle is narrow, with a constriction near the base, giving it a two-jointed appearance. The marsupial plate of the female is very extensive, and is fringed with setæ nearly all round.

The first and second peræopods are alike, apparently differing from the Madagascar species in the stouter form of the fifth joint, which is little longer than broad. The glandular contents of these limbs indicate that the animal is a tube-builder, and the upward or backward position of the finger in the third peræopods seems adapted for movement in such a dwelling. The third peræopods are very much shorter than either of the following pairs, of which the fifth pair is the longer. The hind margin of the second joint in this pair is fringed with long setæ, but by no means so densely as represented in the type species.

The pleopods have two coupling hooks, each with three pairs of reverted teeth, on the inner margin of the peduncle, the opposite margin being fringed with plumose setæ. The first joint of the inner ramus carries three cleft spines. This ramus is decidedly longer than the outer one, although each appears to have about the same number of joints,—twelve to thirteen.

The first uropods are the longest, the peduncle longer than the subequal rami, all strongly spined. In the second pair the peduncle is about equal to the rami; in the third it is much shorter than the

single ramus, which carries several slender spines. In one of the male specimens this ramus has a curious inward curved termination, which appears to be abnormal, but was found alike on each side of the telson. The telson is short, broad and thick ; the under distal margin rounded, the upper excavate, with a projecting point at each corner, within which are some little prominent spines.

Length of the male about 4 mm., that of the female 5 mm.

*Locality.*—

Brackish pools, Port Canning, Lower Bengal, from which the specimens were obtained by Dr. Nelson Annandale.

The specific name is given out of respect to M. Jules Bonnier, whose services to carcinology are in high repute.







## EXPLANATION OF PLATE VI.

GRANDIDIERELLA BONNIERI, sp. nov.

*n.s.* ♂ ♀.—Lines indicating natural size, without antennæ, of the male and female specimens respectively, figured below in lateral view.

*a.s.* ♂, *a.i.* ♂.—First and second antennæ of the male.

*gn.* 1, 2, ♂; *prp.* 1, 3, ♂.—First and second gnathopods, first and third peræopods of the male.

*urp.* 3, ♂; *T.*—Third uropod (abnormal) and telson in dorsal view of a male.

The remaining figures are from the female.

*l.s.*, *l.i.*—Upper and lower lips.

*m.*, *m.*; *mx.* 1, 2; *mxp.*—The two mandibles, first and second maxilla, maxillipeds. The mouth organs are magnified on a higher scale than the other appendages, except the telson and abnormal uropod of a male, of which the larger figure is magnified beyond all the rest.

*gn.* 1, 2; *prp.* 4, 5.—First and second gnathopods, fourth and fifth peræopods.

*urp.* 1, 2, 3; *T.*—First uropod, second and third uropods, with the telson in lateral view.





XIV.—DESCRIPTION OF A NEW SPECIES  
OF *Danio* FROM LOWER  
BURMA.

By B. L. CHAUDHURI, B.A., B.Sc. (Edin.).

*Danio annandalei*, sp. nov.

Br. iii. D I. 15; A II. 16; P. 13; V. I. 8; C 28; L. Lat. 46 to 50;  
L. Trans. 13/3.

Height of body in the total length 3; length of head in the total length 6; interorbital width in length of head 2; diameter of eye in the length of head 4.

The lower jaw is the longer and forms a part of the profile; the cleft of the mouth is directed obliquely upwards and outwards.

*Barbels*.—Two small pairs. The anterior (rostral) pair is once-and-a-half as long as the posterior (maxillary) pair, which is contained five times in the length of the head.

*Fins*.—Dorsal commences six rays in advance of the anal, and there are sixteen rows of scales before its commencement. Pectorals do not reach the ventrals and there is an appendant superior and inner to each pectoral fin not longer than the interorbital width. The ventral fin is smaller and shorter than the pectoral and has no appendant. The anal fin is situated three rows of scales below the lateral line. Fins are diffusely spotted with black spots. The caudal fin is deeply forked. The lateral line is concave and runs from behind the origin of the pectoral fin to the root of the caudal fin. The position of the vent is immediately anterior to the anal fin.

*Colour and markings*.—There are numerous dark spots on the opercles and suborbital region, but none on the scaleless part of the head. The scales are spotted and prettily fringed with dark spots. The back, which is highly curved, is steel-blue, below which the upper one-third is faintly yellow, followed by the middle third, which is variegated in bands and dashes to be described hereafter; then the lower third is faintly yellow (like the upper third), and is terminated by the highly curved silvery belly. As the markings of the middle third are conspicuously different from those found in other allied species, they are described below rather minutely—

- (a) *Transverse markings*.—One transverse steel-blue bar in the pale yellow ground just behind the opercle, broad above and tapering below, followed by a transverse yellow band rather narrow, then a lighter steel-blue transverse band edged with light yellow.

- (b) *Longitudinal markings*.—From above downwards—(1st) one faint steel-blue-gray band, short and thin, only one-fourth of the total length, occupying about the middle portion ; followed by (2nd) a thin yellow band which loses itself behind in a yellow background ; (3rd) a long steel-blue band, broad but rather faint, running as far back as the posterior end of the dorsal fin ; (4th) three broad yellow dashes (broken up) in a steel-blue ground, continuous in a line, with a yellow band behind commencing about the middle and running to the root of the caudal fin, where it loses itself in the yellow ground colour ; (5th) a broad steel-blue band getting broader behind and ending at the third row of scales before the commencement of the caudal fin ; (6th) four or five blurred dashes or round yellow markings losing themselves behind in the steel-blue ground of the band above (5th), which is broader posteriorly ; (7th) three or four bright yellow dashes in a steel-blue ground continuous with a yellow band that commences above the origin of the anal fin and continues towards the caudal fin, but loses itself in the yellow background ; (8th) a steel-blue band tapering posteriorly, gradually disappearing before the yellow band (7th) above ; (9th) a few faint yellow dashes, terminating as it were in the steel-blue background.

Besides other apparent and conspicuous differences the new species differs from *D. spinosus* in possessing appendants to the pectoral fins (whereas *D. spinosus* has none), and from *D. dangila*, which possesses appendants to the ventral fins.

Two specimens were obtained by Dr. Annandale in March, 1908, in a small jungle stream near Kawkareik, at the base of the Dawna Hills in the interior of the Amherst district of Tenasserim. Together with them were taken several specimens of *Danio dangila* and *D. albolineatus*.

The name of the genus is derived from the word "Dhani" (belonging to *dhan* = paddy), by which name all the allied species are collectively called by the Bengalese, probably referring to the smallness of their size or to their being found in grassy jungles in the edges of rivers and lakes. In this habitat these coloured stripes, loops and dashes are of great importance to these small fishes.

## XV.—RHYNCHOTA MALAYANA.

### PART I.

By W. L. DISTANT.

It is proposed in these papers, to give from time to time, contributions to a knowledge of the Rhynchota found to the east of the limits of the area dealt with in the volumes descriptive of the Fauna of British India. A number of species are common to the two areas, and to understand the components of the one, it is necessary to have a knowledge of the other. In fact North Australia cannot be eliminated though it is not proposed to deal with it in these papers. One of the rarest and most distinctive species in the Indian Pentatomidæ is *Amblycara gladiatoria*, Stål. It had only been recorded from "India" and Ceylon, and was of the utmost rarity in collections. Quite recently the British Museum received a specimen collected by Mr. Dodd in Queensland. It is also proposed to occasionally illustrate some of the many Malayan species described by Walker, the descriptions of which are frequently inadequate and provocative of synonymy by writers who cannot consult the types.

### Sub-order HETEROPTERA.

#### Fam. TINGIDIDÆ.

##### Genus ELASMOGNATHUS.

*Elasmognathus*, Fieb., Ent. Monogr., pp. 30 and 90 (1844).

Type *E. helferi*, Fieb.

*Elasmognathus hewetti*, sp. nov. (Pl. vii, figs. 2, 2a.)

Head black with the antenniferous tubercles sometimes ochraceous; pronotum black, the anterior vesicle and lateral areas ochraceous; elytra piceous-brown, the sutural area darker brown, costal area ochraceous, inwardly margined, centrally spotted, and transversely marked with black, apical margin ochraceous, intersected by the apices of the brown veins; abdomen above shining black; body beneath black; legs ochraceous; antennæ brown, the apical joint black; pronotum with the anterior vesicle very coarsely punctate, its disk more thickly and finely punctate with a strong central longitudinal ridge, the lateral areas and the produced margins coarsely granulose, the pronotal posterior elongation more coarsely punctate than on disk, the produced

margins conically globose and upwardly directed; elytra with the discoidal area finely granulose.

Long incl. tegm.  $5\frac{1}{2}$  mm.

Hab.—Borneo; Kuching (Hewitt).

### Fam. LYGÆIDÆ.

#### Sub-fam. Heterogastrinæ.

##### Genus SADOLETUS.

*Sadoletus*, Dist., Faun. B. I. Rhynch., ii, p. 37 (1902).

Type *S. validus*, Dist.

*Sadoletus corvus*, sp. nov.

Head, pronotum and scutellum black; basal margin of pronotum and a central longitudinal line on its posterior lobe ochraceous; corium pale ochraceous, its apical area broadly black; membrane hyaline; body beneath black; legs castaneous-brown, bases of the femora and tarsi pale flavescent; head punctate, antennæ piceous, fourth joint longest, second longer than third; pronotum with the anterior lobe moderately globose, impunctate, posterior lobe coarsely punctate; scutellum finely punctate with a central carinate line which does not quite reach the base; corium coarsely punctate, the punctures arranged in longitudinal series; body beneath finely and obscurely greyish pilose.

Long  $4\frac{1}{2}$  mm.

Hab.—Borneo; Santubong.

##### Genus DINOMACHUS.

*Dinomachus*, Dist., Ann. Mag. Nat. Hist. (7), viii, p. 473 (1901).

Type *D. marshalli*, Dist.

*Dinomachus fusus*, sp. nov. (Pl. vii, figs. 6, 6a.)

Head above fuscous brown, blackish at base, with a central ochraceous longitudinal line which is more distinct between the eyes; pronotum ochraceous, the anterior lobe, excluding lateral areas, black, with a short central ochraceous longitudinal line, posterior lobe with two central longitudinal fasciæ and a transverse spot near each basal angle black; scutellum and corium ochraceous, the latter with the apical area black, its extreme apex ochraceous; membrane hyaline; body beneath black, coxæ and sternal spots ochraceous; legs black, basal halves of femora and annulations to tibiæ pale flavescent; antennæ brownish-ochraceous, first joint short, second longest, a little longer than third, fourth short but longer than first; eyes moderately exserted; pronotum somewhat coarsely punctate, transversely compressed at about one-third from apex, anterior lobe



moderately globose, the posterior margin impunctate; scutellum somewhat thickly punctate, foveately impressed at each basal angle, the disk broadly transversely depressed before apical area; corium coarsely punctate; body beneath obscurely greyish pilose, the lateral margins of the abdomen palely spotted.

Long 6 mm.

Hab.—Borneo; Santubong.

## Sub-order HOMOPTERA.

### Fam. FULGORIDÆ.

#### Sub-fam. Issinæ.

#### Genus HILDA.

*Isthmia*, Walk., List Hom., iii, p. 732 (1851), *nom. præocc.*

*Hilda*, Kirk., Entomologist, 1900, p. 243, *nom. nov.*

Type *H. undata*, Walk.

*Hilda malayensis*, sp. nov. (Pl. vii, figs. 7, 7a.)

Head, pronotum and scutellum pale green; extreme apical margin of vertex almost continuously black; pronotum with the margins narrowly black or piceous, extreme basal margin with an almost continuous series of small greyish dots, basal area of face between the eyes black with four prominent central white spots, the black area also posteriorly narrowly margined with greyish-white, remainder of face and body beneath pale ochraceous; legs darker ochraceous, the anterior and intermediate tibiæ and tarsi piceous; tegmina pale testaceous, an oblique spot on basal area, a central transverse fascia narrowly margined on each side with piceous and widened at costal area into a somewhat large triangular patch greyish-white, the apical area greyish, suffused with pale ochraceous and containing near its inner margin a longitudinal series of small black spots with white centres, some of the spots being duplex; wings slightly fuliginous with fuscous veins; face strongly transversely indented between the insertions of the antennæ; basal margin of vertex finely callose; abdomen above fuscous brown with the segmental margins testaceous.

Long incl. tegm. 5 to 5½ mm.

Hab.—Siam; Malay States; Bukit Besar (Annandale and Robinson; Brit. Mus.).

### Fam. CERCOPIDÆ.

#### Genus EUCLOVIA.

*Euclovia*, Matsum., Journ. Sapporo Agr. Coll., ii, p. 24 (1903).

Type *E. okadæ*, Matsum.

*Euclovia convexa*, sp. nov. (Pl. vii, figs. 10, 10a.)

Vertex brownish ochraceous; pronotum ochraceous, a large transverse spot near anterior margin, and the posterior margin brownish; scutellum pale ochraceous; body beneath and legs brownish ochraceous; head beneath pale ochraceous, anterior margin to eyes, and the face centrally longitudinally black; an oblique spot near outer margin of cheeks, and a transverse spot on the acetabula black; tegmina ochraceous, basal area (mottled with ochraceous), a broad irregular discontinuous central fascia which is connected with the apex by a longitudinal streak, an apical costal streak and most of the veins piceous; vertex transversely impressed before apex; ocelli somewhat close together a little before basal margin; clypeus long and slender, extending between the anterior coxæ; face centrally longitudinally ridged; posterior tibiæ with two spines.

Long incl. tegm.  $7\frac{1}{2}$  mm.

Hab.—Borneo; Kuching (Hewitt).

## Genus DINDA, gen. nov.

Vertex shorter than pronotum, sub-conically produced in front of eyes, the lateral and apical margins acute and reflexed, about as long as breadth between eyes, a discal conical carination on anterior half commencing on both sides at about middle of disk and united at apex; ocelli a little before base and in front of eyes, about as near to each other as to eyes; face flattened, slightly widened posteriorly, coarsely punctate, with an obscure central carination which does not reach base; clypeus long and broad, very strongly centrally longitudinally ridged; eyes long, oblique; pronotum much longer than vertex, lateral margins obliquely straight, anterior margin moderately convexly rounded, margins from basal angles to scutellum obliquely directed inwardly, posterior margin subangularly sinuate; scutellum subtriangular, its apex acute; rostrum reaching the intermediate coxæ; legs moderately short, posterior tibiæ with two spines; tegmina coriaceous, passing apex of abdomen, the apex rounded.

Type *D. maura*, Walk.

*Dinda maura*. (Pl. vii, figs. 1, 1a.)

*Aphrophora maura*, Walk., List Hom. Suppl., p. 187 (1858).

Vertex thickly punctate, the discal conical carination prominent; pronotum thickly punctate and slightly transversely wrinkled; scutellum with the lateral margins ridged; tegmina very thickly and finely punctate, their lateral margins narrowly obscurely castaneous; legs pale flavescent, tarsal claws piceous; rostrum pale flavescent.

Hab.—Singapore (Brit. Mus.). Borneo; Sarawak (Wallace; Brit. Mus., Sarawak Mus. and Coll. Dist.).

## Genus LORA, gen. nov.

Vertex conically produced in front of eyes, longer than space between eyes, strongly centrally longitudinally ridged, a transverse discal line near middle of disk from the ends of which an oblique line proceeds on each side to lateral margin, lateral and apical margins strongly ridged and reflexed; ocelli between eyes very much nearer to each other than to eyes which are long and oblique; face longitudinally broadly sulcate for half its length from base, the margins of the sulcate area strongly ridged; pronotum considerably longer than vertex, its anterior margin a little rounded, the lateral margins outwardly oblique to posterior angles, thence inwardly oblique to scutellum, posterior margin angularly sinuate; scutellum subtriangular; legs moderately short, posterior tibiæ with one spine; tegmina coriaceous, much longer than abdomen, the apices rounded.

Type *L. inclyta*, Walk.

*Lora inclyta*. (Pl. vii, figs. 3, 3a.)

*Aphrophora inclyta*, Walk., List Hom. Suppl., p. 187 (1858).

Pronotum and scutellum thickly finely punctate, obscurely wrinkled and very shortly ochraceously pilose; tegmina thickly finely punctate and sparingly transversely wrinkled; face strongly transversely striate on each side of the central sulcation; tarsi piceous.

Hab.—Borneo; Sarawak (Wallace; Brit. Mus.). S.-E. Borneo (Doherty; Coll. Dist.).

## Genus DAHA.

*Daha*, Dist., Faun. B. I. Rhynch., iv, p. 107 (1907).

Type *D. arietaria*, Dist.

*Daha kuchingensis*, sp. nov.

Body above and beneath and legs black; tegmina with a small triangular white costal spot on apical area; vertex finely tricarinate, the central carination very obsolete before reaching base, finely and obscurely punctate; eyes black margined with greyish; pronotum and scutellum very finely transversely rugulose; tegmina minutely thickly punctate.

Long  $6\frac{1}{2}$  to 7 mm.

Hab.—Borneo; Kuching (Hewitt).

## Genus EOSCARTA.

*Eoscarta*, Bredd., Soc. Ent., xvii, p. 58 (1902).

*Euryaulax*, Kirk., Rep. Exp. Stat. Haw. Plant. Assoc., pt. ix, p. 380 (1906).

Type *E. borealis*, Dist., = *E. eos*, Bredd.

*Eoscarta subdolens*.

*Cercopis subdolens*, Walk., Journ. Linn. Soc. Zool., i, p. 165 (1857).

*Triecphora subpustulata*, Walk., List. Hom. Suppl., p. 343 (1858).  
Hab.—Sarawak (Wallace; Brit. Mus.). Kuching (Sarawak Mus.).

*Eoscarta borealis*.

*Cosmoscarta borealis*, Dist., Tr. Ent. Soc. Lond., 1878, p. 321.

*Eoscarta borealis*, Dist., Faun. B. I. Rhynch., iv, p. 116 (1907).

*Eoscarta eos*, Bredd., Soc. Ent., xvii, p. 58 (1902).

Hab.—Assam; Tenasserim; Malay Peninsula; Perak (Doherty).

Siam; Malay States; Bukit Besar (Annand. and Robins.).

This species varies in the colour of the tibiae; in some specimens they are wholly black, in others black only at apices.

*Eoscarta rufa*.

*Triecphora rufa*, Walk., Journ. Linn. Soc. Zool., x, p. 289 (1869).

Hab.—New Guinea (Wallace; Brit. Mus.).

*Eoscarta ferruginea*.

*Triecphora ferruginea*, Walk., List Hom., iii, p. 672 (1851).

*Cercopis ferruginea*, Stål, Öfv. Vet.-Ak. Förh., 1870, p. 721.

Hab.—Philippine Islds.

*Eoscarta antica*.

*Triecphora antica*, Walk., Journ. Linn. Soc. Zool., x, p. 289 (1869).

Hab.—Mysol (Wallace; Brit. Mus.).

#### Genus CONSIDIA.

*Considia*, Stål, Öfv. Vet.-Ak. Förh., 1865, p. 152.

*Tettigoscarta*, Bredd., Soc. Ent., xvii, p. 59 (1902).

*Sialoscarta*, Jacobi, Mitt. Zool. Mus. Berl., iii, p. 23 (1905).

Type *C. transversa*, Walk.

*Considia transversa*.

*Cercopis transversa*, Walk., List Hom. Suppl., iv, p. 1151 (1852).

*Considia oblonga*, Stål, Öfv. Vet.-Ak. Förh., 1865, p. 152.

Hab.—Java.

*Considia nitidula*.

*Tettigoscarta nitidula*, Bredd., Soc. Ent., xvii, p. 59 (1902).

Hab.—Malacca. Siam; Malay States; Bukit Besar (Annand. and Robins.; Brit. Mus.). Siam (Brit. Mus.).

*Considia cavata*.

*Triecphora cavata*, Walk., List Hom. Suppl., p. 343 (1858).

*Sialoscarta concinna*, Jacobi, Mitt. Zool. Mus. Berl., iii, p. 23; taf. i, fig. 10 (1905).

Hab.—Java.

#### Genus AUFIDUS.

*Aufidus*, Stål, Trans. Ent. Soc. Lond. (3), i, p. 594 (1863).

*Aufidellus*, Kirk., Rep. Exp. Stat. Haw. Plant. Assoc., pt. ix, p. 381 (1906).

*Aufiterna*, Kirk., loc. cit., p. 382.

*Aufidellus*, Kirk., cannot be separated from *Aufidus*. The type of Stål's genus (*A. trifasciatus*) is in the British Museum, as is also a specimen of the species described by Kirkaldy as *A. australensis*. The differential and only characters given by the last-named writer, "pronotum posteriorly is almost evenly rounded and the costal margin is not arched basally," constitute (when the species is examined) only very moderate specific differentiation. In his description of another proposed genus, *Aufiterna*,<sup>1</sup> he writes "posterior margin emarginate, while it is truncate in *Aufidus*." This is inaccurate; in the type of *Aufidus* (*A. trifasciatus*), the posterior pronotal margin is distinctly emarginate; neither did Stål make that structural character a generic distinction; he simply wrote "Thorax sexangularis." On the other hand *Aufiterna*, Kirk., is apparently only to be separated from *Aufidus* by the venation of the tegmina, "3 discoidals (subapical), 4 apicals well marked, while there are another 5 small cells marked off on the costal cell." It will be seen by the figure here given, that all these characters are more or less represented, and that the divisions of the costal cell are inconstant even in the same species and even in the same specimen.

*Aufidus spectabilis*, sp. nov. (Pl. vii, figs. 5, 5a.)

Head, pronotum, and scutellum ochraceous; a transverse spot at apex of vertex, a broad fascia between eyes, and a broad basal fascia to pronotum black; body beneath and legs ochraceous, basal half of face black, anterior tibiae longitudinally streaked with black, tarsi more or less piceous; abdomen above testaceous; tegmina with the basal third ochraceous and opaque, this area outwardly margined by a transverse black fascia and containing a black streak on upper claval margin with the lower basal margin of the clavus also black, remaining area of tegmina hyaline with apical ochraceous suffusions, veins alternately ochraceous or piceous, costal area ochraceous; wings hyaline, palely ochraceous on basal area, the veins pale-fuscous; vertex with a fine central longitudinal carination, and with a transverse impression near middle; pronotum with a central longitudinal sulcation not reaching the anterior margin, the posterior margin slightly emarginate; face globose, laterally compressed, centrally longitudinally sulcate on disk, costal cell with three or four small cells marked off by transverse veins.

Long excl. tegm.  $6\frac{1}{2}$  mm. Exp. tegm. 18 to 20 mm.

Hab.—Malay Archipelago; Halmaheira (Doherty; Brit. Mus.).

*Aufidus papuanus*, sp. nov.

Vertex and pronotum ochraceous; vertex with the apical margin narrowly and the basal margin broadly black; pronotum

<sup>1</sup> Kirkaldy says this genus is more allied to *Polychatophyes*, of which the typical species is referred to "pl. xxxiii, figs. 12 and 13," but no such illustration can be traced.

with about the basal half black ; scutellum testaceous ; body beneath and legs ochraceous, basal margin of face, a spot between face and eyes, a longitudinal streak to anterior tibiæ, anterior tarsi, tarsal claws, apex of rostrum, and lateral margins and apical area of abdomen beneath, piceous or black ; tegmina with basal fourth ochraceous and opaque, this area broadly outwardly transversely margined with black, and containing a broad piceous claval streak, central area hyaline, the veins and the whole of the apical fourth fuscous brown, costal margin ochraceous ; vertex without a central carination, face centrally sulcate for about half its length from base ; pronotum centrally longitudinally sulcate on disk, its posterior margin almost straight ; scutellum discally foveate ; tegmina (in type) with six small cells in the costal cell of one tegmen and only three distinct cells in that of the other tegmen.

Long incl. tegm. 10 mm.

Hab.—New Guinea ; Humboldt Bay (Doherty ; Brit. Mus.).

*Aufidus erebus*, sp. nov.

Vertex pale luteous, a broad transverse fascia extending from base to anterior margins of eyes, and the apical margin black ; pronotum pale luteous with a broad central brownish transverse fascia ; scutellum pale luteous, the anterior margin and basal angles black ; head beneath black, apices of face and cheeks, and the basal margin between face and eyes ochraceous ; sternum and legs ochraceous, anterior tibiæ and all the tarsal claws piceous ; abdomen beneath black ; tegmina hyaline, the veins robust and black, basal fourth black, apical fourth piceous, costal margin ochraceous ; vertex smooth not carinate ; face broadly longitudinally sulcate for nearly its entire length ; pronotum finely centrally discally sulcate ; scutellum discally foveate ; tegmina with the costal cell divided into three small cells on one tegmen, and into four on the other.

Long incl. tegm. 9 mm.

Hab.—New Guinea ; Humboldt Bay (Doherty ; Brit. Mus.).

Genus COLSA.

*Colsa*, Walk., Journ. Linn. Soc. Zool., i, p. 96 (1856).

Type *C. costæstriga*, Walk.

*Colsa matanga*, sp. nov. (Pl. vii, figs. 8, 8a.)

Vertex black, the front ochraceous ; pronotum black, the anterior area broadly ochraceous ; scutellum ochraceous, the basal angles black ; abdomen above black, the basal area, the lateral margins and the anal appendage ochraceous ; head beneath, legs and sternum ochraceous ; central area and transverse striations to face, apices of anterior tibiæ, apices of tarsi, sternal spots and disk of abdomen beneath black ; lateral margins of abdomen pale ochraceous, with the segmental incisures black ; tegmina pale

hyaline, the veins fuscous brown, costal area piceous interrupted by an oblique transverse white spot beyond middle, and at apex almost narrowly continued across disk; posterior margin of claws piceous, an ochraceous spot at base; wings hyaline, the veins mostly darker, a little infusate on posterior and apical margins, transverse veins in postcostal cell varying from five to six; vertex transversely impressed at union with front; face sulcate for its whole length, the sulcation narrower at base; pronotum centrally longitudinally impressed on basal area; scutellum broadly centrally foveate.

Long incl. tegm. 12 to 13 mm.

Hab.—Borneo; Matang.

#### Genus NOTOSCARTA.

*Notoscarta*, Bredd., Soc. Ent., xvii, p. 59 (1902).

Type *N. croceonigra*, Bredd.

*Notoscarta alboater*.

*Aufidus alboater*, Walk., Journ. Linn. Soc. Zool., x, p. 292 (1869).

*Notoscarta ptyeloides*, Bredd., Soc. Ent., xvii, p. 59 (1902).

Hab.—New Guinea; Mysol.

#### *Notoscarta zebrina*, sp. nov.

Vertex and pronotum black; vertex with a pale marginal spot in front of each eye, eyes and scutellum greyish white; body beneath black; apex of face, clypeus, rostrum, coxæ, legs and the abdominal segmental margins, greyish white; tegmina black; a costal marginal spot extending to about one-third from base and curved inward at its apex, almost apical half of the costal area divided by three transverse piceous lines, and a spot at apex of clavus (posteriorly divided) greyish white; face subglobose, faintly transversely striate on each side; rostrum reaching the intermediate coxæ; pronotum thickly finely transversely striate.

Long incl. tegm.  $5\frac{1}{2}$  mm.

Hab.—Mysol (Wallace; Brit. Mus.).

#### Genus MIOSCARTA.

*Mioscarta*, Bredd., Allg. Zeitschr. Ent., vi, p. 123 (1901).

Type *M. forcipata*, Bredd.

*Mioscarta bipars*.

*Aufidus bipars*, Walk., Journ. Linn. Soc. Zool., x, p. 290 (1869).

*Aufidus partitus*, Walk., loc. cit.

Hab.—Celebes.

#### Fam. JASSIDÆ.

##### Sub-fam. Bythoscopinæ.

#### Genus IDIOCERUS.

*Idiocerus*, Lewis, Trans., Ent. Soc. Lond., 1, p. 47 (1836).

Type *I. adustus*, Herrich-Sch.

*Idiocerus nitidulus*.

*Iassus nitidulus*, Walk., Journ. Linn. Soc. Lond. Zool., x, p. 322 (1869).

Hab.—Mysol.

Allied to *I. niveosparsus*, Leth.

*Idiocerus laticeps*.

*Iassus laticeps*, Walk., Journ. Linn. Soc. Lond. Zool., x, p. 323 (1869).

Hab.—Celebes.

This species is closely allied to the preceding and principally differs by the markings of the face, and may probably be but a variety of *I. nitidulus*. In his description Walker has omitted to mention the presence of a somewhat large triangular black spot near each basal angle of the scutellum.

#### Genus BYTHOSCOPIUS.

*Bythoscopus*, Germ., in Silbern. Rev. Ent., i, p. 180 (1833); Dist., Faun. B. I. Rhynch., iv, p. 190 (1907).

Type *B. lanio*, Linn.

*Bythoscopus punctatus*.

*Idiocerus* ? *punctatus*, Kirby, in Mon. Christ. Isld., p. 138 (1900).

Hab.—Christmas Isld.

*Bythoscopus unicolor*.

*Bythoscopus unicolor*, Walk., Journ. Linn. Soc. Lond. Zool., x, p. 320 (1869).

Hab.—Celebes.

#### Genus BALOCHA.

*Balocha*, Dist., Faun. B. I. Rhynch., iv, p. 189 (1907).

Type *B. tricolor*, Dist.

*Balocha angulifer*.

*Iassus* ? *angulifer*, Walk., Journ. Linn. Soc. Lond. Zool., x, p. 325 (1869).

Hab.—Mysol.

#### Genus CHUNRA.

*Chunra*, Dist., Faun. B. I. Rhynch., iv, p. 193 (1907).

Type *C. puncticosta*, Walk.

*Chunra gigantea*, sp. nov. (Pl. vii, figs. 11, 11a.)

Vertex, pronotum and scutellum very pale ochraceous; vertex with a pale central longitudinal fascia on each side of which is a darker fascia, a fuscous spot before eyes and two central fuscous transverse spots near base; eyes castaneous; pronotum with four large fuscous brown spots crossing disk, the two central ones longitudinal and posteriorly united, the lateral spots subtriangular; scutellum with four large spots on basal half, the two central ones almost fused, and the apex fuscous-brown, a piceous spot on



each lateral margin; abdomen above testaceous; head beneath sternum and legs pale ochraceous, abdomen beneath testaceous; margins of face, two anterior comma-like oblique spots, an oblique line before each eye, and a posterior broad central longitudinal spot fuscous brown; apices of tibiae and the tarsi more or less infusate; tegmina smoky hyaline, the veins fuscous brown, costal area fuscous brown mottled with pale ochraceous, apical margin and a subapical marginal fascia fuscous brown; wings smoky hyaline, the veins fuscous brown, outer margins a little infusate; ocelli prominent, as near to each other as to eyes; scutellum long and broad, longer than pronotum and vertex together.

Long excl. tegm., ♀, 9 mm. Exp. tegm. 19 to 20 mm.

Hab.—Borneo; Kuching (Shelford); S.-E. Province (Doherty).

### Sub-fam. Tettigoniellinae.

*Tettigoniellinae*, Dist., Faun. B. I. Rhynch., iv, p. 200 (1907) (incl. synonymy).

*Tettigoniidae*, Kirk., Rep. Exp. Stat. Haw. Plant. Assoc., pt. ix, p. 316 (1906).

The name *Tettigoniellidae* was first applied to this sub-family by Dr. Melichar. In the reference above given will be found a full synonymy of other terms used.

### Genus TETTIGONIELLA.

*Tetigonia*, Geoffr., Hist. abreg. des Ins., i, p. 429 (1798-99), *nom. præocc.*

*Tettigoniella*, Jacobi, Zool. Jahr. Syst., xix, p. 778 (1904), *nom. nov.*

*Tettigoniella eburnea*.

*Tettigonia eburnea*, Walk., Journ. Linn. Soc. Lond. Zool., i, p. 168 (1856).

Walker's short description is quite inadequate and misleading; the following description is taken from the type and two other specimens, all collected by Wallace at Sarawak.

Head, pronotum and scutellum stramineous; vertex with two small spots at apex and a larger discal spot, black; head beneath, sternum and legs very pale stramineous; abdomen beneath golden yellow; tegmina and wings milky white.

Although Walker's description *supra* is simply "whitish, vertex of head conical. Wings milk-white," he subsequently (Journ. Linn. Soc. Lond. Zool., x, p. 304, 1869) refers to it in a different way, and implies that there are "black marks on the head."

Hab.—Borneo.

*Tettigoniella erichsoni*, sp. nov. (Pl. viii, figs. 2, 2a.)

Vertex dark indigo-blue, much paler on each side near eyes pronotum pale ochraceous, the anterior and lateral margins broadly

bluish grey; scutellum pale ochraceous, its apex dark indigo-blue; abdomen above and body beneath dark indigo-blue; apex of anal segment, cheeks, lateral areas of prosternum, coxæ and legs stramineous; apices of femora, tibiæ and tarsi more or less indigo-blue, bases of posterior tarsi stramineous; tegmina with less than basal half very pale stramineous, sometimes with a few brownish spots near base, remaining area fuscous brown with discal bluish suffusions; wings fuliginous brown, the veins darker; vertex broad, rounded anteriorly, foveately impressed near each eye; face somewhat discally depressed, transversely striate on each lateral area.

Long excl. tegm., ♂, and ♀, 10 to 11 mm. Exp. tegm. 23 mm.

Hab.—Sumatra (Erichson; Brit. Mus.; Forbes; Coll. Dist.).

*Tettigoniella ramana*, sp. nov. (Pl. viii, figs. 15, 15a.)

Vertex indigo-blue, much paler and brighter blue on basal area; pronotum bronzy yellow, the anterior and lateral areas suffused with pale blue; scutellum bronzy yellow more or less suffused with pale blue; abdomen above shining purplish blue, faintly tomentose; body beneath and legs testaceous suffused with bluish, abdomen beneath more testaceous, the anal segment, sublateral segmental spots and anal appendage, more or less bluish; tegmina bronzy yellow, basal fourth pale violaceous containing two dark spots, some inconstant violaceous suffusions on disk (sometimes practically absent), beyond clavus and encroaching on apical area, subhyaline; wings dark fuliginous; vertex broad, anteriorly rounded, centrally discally impressed; face broadly longitudinally smooth and pale bluish, the lateral areas brownish and strongly transversely striate.

Long excl. tegm., ♀, 12 mm. Exp. tegm. 26 to 27 mm.

Hab.—Sumatra (Erichson; Brit. Mus.).

*Var.* Abdomen above testaceous. (Probably a rubbed or spirit specimen.)

Allied to *T. ferruginea*, Fabr.

*Tettigoniella cumatilis*, sp. nov. (Pl. viii, figs. 5, 5a.)

Body, legs and tegmina pale bluish with fuscous brown shadings; wings pale fuscous brown with blue suffusions on basal area; vertex with two large black spots commencing near ocelli and united on anterior margin; pronotum blackish on basal area; face centrally broadly and longitudinally smooth and bluish, the lateral areas more or less black and coarsely transversely striate, the cheeks thickly whitely tomentose; abdomen beneath whitely tomentose; legs darker, somewhat blackish; tegmina (when not rubbed) regularly bluish except at apical margins which are somewhat broadly fuscous brown; vertex foveately impressed at the region of each ocellus; abdomen above with a central longitudinal ridge, vertex broadly anteriorly rounded.

Long excl. tegm., ♂, 8 mm. Exp. tegm. 17 to 18 mm.

Hab.—Malay Peninsula; S. Perak (Ridley; Brit. Mus.).  
Borneo; Sarawak (Shelford; Brit. Mus.).

*Tettigoniella tamborensis*, sp. nov. (Pl. viii, figs. 1, 1a.)

Vertex orange-red, the disk nearly wholly occupied by a large black spot which, commencing at base, is angulated on each side in front of eyes and is narrowed and bifid near anterior margin; pronotum orange-red, its anterior and posterior margins irregularly black; scutellum wholly black; head beneath orange-red, face and clypeus with a central longitudinal black fascia; sternum, abdomen beneath and legs very pale ochraceous; spots on each side of prosternum, posterior abdominal marginal segments (interrupted on disk), apex of anal segment, and lateral abdominal spots, black; tegmina reddish-ochraceous, costal, claval and inner margins somewhat broadly black, apical area brownish, inwardly black; vertex moderately long, somewhat conically rounded in front, a little depressed between ocelli; pronotum sparsely obscurely punctate; scutellum transversely impressed before apical area.

Long incl. tegm., ♀, 12 mm.

Hab.—Malay Archipelago; Tambora, Sambawa (Doherty; Brit. Mus.).

*Tettigoniella timorensis*, sp. nov. (Pl. viii, figs. 3, 3a.)

Head, pronotum, body beneath and legs ochraceous; vertex with three black spots, two transverse on anterior margin and one larger and irregularly shaped at base; pronotum with a small linear transverse spot at middle of anterior margin, and the posterior margin broadly black; scutellum with a black discal spot; face with two black basal spots (which are a continuation of the two on the anterior margin of vertex; tibiae brownish ochraceous, tarsal claws black; tegmina ochraceous, with three longitudinal black fasciae, one costal which becomes subcostal before apical area, one before inner claval margin, and the other on posterior claval margin extending for about two-thirds its length from base; vertex broad and rounded in front, a little foveately impressed at inner margins of eyes; pronotum smooth and shining, discally arcuately impressed before anterior margin; scutellum strongly transversely impressed before apical area.

Long incl. tegm., ♀,  $9\frac{1}{2}$  to 10 mm.

Hab.—Malay Archipelago; Timor Dili, Wetter near Timor (Doherty; Brit. Mus.).

*Tettigoniella wetterensis*, sp. nov. (Pl. viii, figs. 4, 4a.)

Head, pronotum and body beneath ochraceous; legs stramineous; vertex with three black spots, two on anterior margin and one at base; pronotum with a large transverse anteriorly

inwardly angulated basal spot, a small transverse spot on anterior margin, and a slender central discal longitudinal line, black, near anterior margin, a discal transversely angulated pale ochraceous impression; scutellum with a large black spot which occupies the whole of the surface excluding the lateral and apical areas; face with two elongate black basal spots (which are a continuation of the two on the anterior margin of vertex); tarsal claws piceous; tegmina olivaceous brown, the costal area more ochraceous, the costal margin and the apex, black. Allied to *T. timorensis*, Dist., but differing by the different colour and markings of the tegmina, different maculation to the pronotum and scutellum, and the pale unicolorous legs with the tarsal claws only darker.

Long incl. tegm., ♀, 11 mm.

Hab.—Malay Archipelago; Wetter near Timor (Doherty).

*Tettigoniella mitrata*, sp. nov. (Pl. viii, figs. 6, 6a.)

Vertex pale purplish, the apical margin broadly black, the posterior lateral margins near the eyes, ochraceous; pronotum ochraceous, excluding anterior area thickly blackly punctate, the basal margin black; scutellum ochraceous; body beneath and legs ochraceous, a short central black line at base of face; sternum more or less whitishly tomentose, abdomen beneath with large brownish spots; tegmina black, costal margins and claval sutural margins very narrowly ochraceous, apices inwardly obscurely subhyaline; vertex broad, rounded in front, a little apically upturned, thus giving the disk a foveate appearance; ocelli placed far apart, rather near the eyes; face long, centrally flattened, the lateral areas transversely striate; scutellum very strongly transversely impressed before apical area.

Long incl. tegm. 9 mm.

Hab.—New Guinea; Humboldt Bay (Doherty; Brit. Mus.).

*Tettigoniella annandalei*, sp. nov. (Pl. viii, figs. 7, 7a.)

Very pale virescent; vertex, anterior area of pronotum, scutellum, body beneath and legs more ochraceous; vertex with a large outwardly branching black spot, commencing near the neighbourhood of the ocelli and then continued on each side to apex; pronotum pale shining greyish, the anterior area pale ochraceous, a somewhat large and angulated black spot on disk; scutellum with a large black spot in each basal angle; face with two short anterior discal black stripes continued from those on vertex, and the posterior halves of the lateral margins broadly black; tegmina pale virescent, the apical areas subhyaline, two transverse black spots on clavus, one near middle the other near apex, two transverse black spots on corium, the first extending from claval to costal margins, the second shorter and discal, the hyaline apical area inwardly margined with black, and a small piceous spot near middle of claval suture; vertex broad, anteriorly rounded;

face posteriorly longitudinally wrinkled; pronotum convex, depressed anteriorly; scutellum depressed to, and transversely impressed before apical area.

Long incl. tegm. 12 mm.

Hab.—Malay Peninsula; S. Perak, Talum (Annandale and Robinson; Brit. Mus.).

Allied to the Bornean *T. scitipennis*, Walk.

*Tettigoniella perakensis*.

Head, pronotum, scutellum, body beneath and legs ochraceous; vertex spotted with black, a spot at apex, another at middle of posterior disk, and two on posterior margin which are almost connected with a curved line in front of each of them; pronotum with a black spot near middle of each lateral margin; scutellum with three black basal spots, and a subapical black one; tegmina pale bluish-grey sparingly sprinkled with ochraceous, costal and claval sutural margins very narrowly ochraceous, apical area subhyaline, a black spot crossing apex of clavus and another subcostal black spot near apex; vertex broad and rounded in front; pronotum thickly brownly punctate; face broad, globose, the marginal areas transversely striate.

Long incl. tegm. 12 mm.

Hab.—Malay Peninsula; Perak (Doherty; Coll. Dist.).

*Tettigoniella baluensis*, sp. nov.

Head, pronotum, and scutellum very pale luteous; vertex with a large central black spot; pronotum with a broad anterior transverse fascia and two semicircular basal spots, black; scutellum with two lunulate spots on anterior margin and a discal spot prolonged towards apex, black; face with a triangular spot at base and the apex black; body beneath black; legs pale luteous, base and apex of anterior femora, the whole of the intermediate and posterior femora, and apices of the tibiae and tarsi black; margins of the abdominal segments beneath narrowly pale luteous; tegmina orange-red, their apices, excluding posterior border, black; head broad, rounded in front, excavate on each side before eyes; face broadly longitudinally flattened in the middle the lateral areas transversely striate; pronotum sparingly obscurely punctate.

Long incl. tegm. 12 mm.

Hab.—Borneo; Kina Balu (Brit. Mus.).

*Tettigoniella horsfieldi*, sp. nov. (Pl. viii, figs. 17, 17a.)

Vertex ochraceous or pale testaceous, the whole disk excluding margins occupied by a large black spot; pronotum and scutellum pale testaceous; abdomen above pale testaceous, its disk longitudinally purplish red; face brownish ochraceous, two small black spots at the middle of the basal margin and a black longitudinal

central fascia extending for about half the length from base ; margins of eyes black ; abdomen beneath pale testaceous, the lateral margins ochraceous ; legs ochraceous, the anterior legs darker ; tegmina pale ochraceous, the clavus, base, two broad transverse fasciæ, the first near middle, the other near end of clavus, pale testaceous, the outermost fascia united posteriorly with a bright purplish fascia, the two including a greyish spot ; apical area more or less fuscous ; wings fuliginous, the veins piceous ; vertex long, as long as breadth between eyes, moderately globose, with a central ill-defined longitudinal ridge, excavate on each side near eyes ; face globose, the central area flattened, the lateral areas ridged ; pronotum with a central arcuate ridge before the anterior margin.

Long excl. tegm., ♀, 9 mm. Exp. tegm. 21 mm.

Hab.—Java (Horsfield Coll. ; Brit. Mus.).

*T. trita*, Walk., is allied to this species.

*Tettigoniella mouhoti*, sp. nov.

Testaceous ; two spots on apical margin of vertex and a central elongated spot at its base, three rounded spots to pronotum—one before middle of anterior margin, the other two wide apart on basal margin ; four spots to scutellum—three on basal margin, one discal and rounded before apical area, a spot at base of tegmina, a transverse fascia to face before clypeus ; large spots to sternum, coxæ, apices of femora and tibiæ, the tarsi, and abdomen beneath black ; abdominal margins beneath, the two apical segments excluding central spots, and the anal segment ochraceous or testaceous ; apical area of tegmina inwardly extended to apex of clavus obscure subhyaline ; wings black ; vertex long, obliquely rounded anteriorly, about as long as breadth between eyes, centrally basally somewhat flattened, the lateral margins moderately broadly deflexed ; face very broadly centrally flattened, the lateral areas transversely striate ; pronotum transversely arcuately depressed a little in front of middle ; scutellum transversely impressed before apical area.

Long incl. tegm., ♀, 18 mm.

Hab.—Siam (Mouhot ; Brit. Mus.).

*T. clongata*, Walk., from Borneo is an allied species.

*Tettigoniella whiteheadi*, sp. nov. (Pl. viii, figs. 9, 9a.)

Head, pronotum, scutellum, body beneath and legs stramineous or very pale ochraceous ; vertex with two small central spots on apical margin, a cordate spot at middle of basal margin, and a spot on each lateral margin between eyes and apex, black ; margins of central area to face, black ; pronotum with a central longitudinal black fascia which is attenuated on the anterior area ; scutellum with a central longitudinal black fascia which does not quite reach apex ; apices of tarsi piceous ; tegmina milky-white, most of the veins piceous, claval sutural margin black ; vertex

somewhat convex, rather obliquely rounded in front, transversely impressed in front of eyes; pronotum nearly twice as long as vertex, transversely striate, with a discal angulate impression a little before anterior margin; scutellum lunately impressed before apical area; face centrally broadly flattened, the lateral areas finely transversely striate; tegmina practically smooth, very indistinctly finely wrinkled.

Long incl. tegm. 11 mm.

Hab.—Philippines (Whitehead; Brit. Mus.).

Allied to *T. nigrilinea*, Stål.

*Tettigoniella wallacei*, sp. nov. (Pl. viii, figs. 10, 10a.)

Head, pronotum, scutellum, sternum and legs pale ochraceous; abdomen beneath orange-yellow; ocelli black; tegmina subhyaline, the veins yellowish; claval sutural margin black, which is piceously continued about half-way to apex; vertex broadly transverse rounded in front; pronotum arcuately impressed before anterior margin; face centrally discally longitudinally flattened, the lateral areas strongly transversely striate.

Long incl. tegm. 6 mm.

Hab.—Malay Archipelago; Mysol (Wallace; Brit. Mus.).

#### Genus BHANDARA.

*Bhandara*, Dist., Faun. Brit. Ind. Rhynch., iv, p. 221 (1907).

Type *B. semiclara*, Sign.

*Bhandara sarawakensis*, sp. nov.

Vertex, pronotum, scutellum and tegmina black; body beneath and legs pale ochraceous; base, sometimes basal two-thirds of face, and the lateral striations to same, a large spot on each side of mesosternum, apices of tibiae, the tarsi and margins of anal segment, black or piceous; lateral margins of vertex and inner margins of eyes ochraceous (in some specimens this character is barely discernible); vertex broad, transverse, rounded in front, broadly foveately excavate at middle of basal area, also foveately impressed on each side near inner margins of eyes; pronotum very indistinctly transversely wrinkled, with a short transverse discal arcuate impression near anterior margin; scutellum transversely impressed before apical area which is slightly gibbous, the extreme apex linearly acute; tegmina only finely wrinkled, the apical half of costal area and the apical margin brownish; face centrally broadly flattened, its lateral areas strongly transversely striate.

Long incl. tegm., ♀, 14 mm.

Hab.—Borneo; Sarawak (Shelford; Brit. Mus.).

*Bhandara picturata*, sp. nov. (Pl. viii, figs. 18, 18a.)

Vertex black, a somewhat large flavescent spot on each lateral margin and the inner margins of eyes of the same colour; pronotum

black with a large inwardly subangulate flavescent spot on each lateral area; scutellum black; the lateral areas of mesonotum flavescent; abdomen reddish ochraceous, a transverse basal spot and the greater part of the disk longitudinally black, a series of black spots on connexivum; body beneath and legs pale ochraceous, a black spot on each side of mesosternum, and a large basal triangular black spot to face; tegmina reddish-ochraceous, a large pale spot on clavus broadly black at each end, and the veins within it also black; a discal black spot beyond middle, and a large black spot crossing tegmen near apex and which is broadly widened on the inner margin; wings dark fuliginous, paler on costal area; vertex with three prominent foveations on basal area, the central foveation largest and ovate and situate between the ocelli; face finely transversely carinate on each lateral area.

Long excl. tegm., ♀, 11 mm. Exp. tegm. 25 mm.

Hab.—Malay Peninsula; Perak (Doherty).

#### Genus KOLLA.

*Kolla*, Dist., Faun. Brit. Ind. Rhynch., iv, p. 223 (1907).

Type *K. insignis*, Dist.

*Kolla polita* (Tab. fig. 14a).

*Tettigonia polita*, Walk., Journ. Linn. Soc. Lond. Zool., i, p. 168 (1857).

Hab.—Borneo.

#### Genus SPHINCTOGONIA.

*Sphinctogonia*, Bredd., Abh. Nat. Ges. Halle, xxiv, p. 128 (1901).

Type *S. guttivitta*, Walk.

*Sphinctogonia guttivitta*.

*Tettigonia guttivitta*, Walk., Journ. Linn. Soc. Lond. Zool., x, p. 301 (1869).

*Sphinctogonia quincuncula*, Bredd., Abh. Nat. Ges. Halle, xxiv, p. 128 (1901).

Hab.—Celebes.

*Sphinctogonia lineolata*. (Pl. viii, figs. 16, 16a.)

*Tettigonia lineolata*, Walk., Journ. Linn. Soc. Lond. Zool., i, p. 167 (1857).

Hab.—Borneo.

#### Sub-fam. Gyponinae (?).

##### Genus DODA, gen. nov.

Vertex longer than broad between eyes, centrally strongly longitudinally carinate, strongly foveate at inner margins of eyes, ocelli placed submarginally just in front of eyes; antennae long and slender, above half the length of body; face elongate, longer than broad, slightly gibbous, sinuate at inner margins of eyes; pronotum moderately convex, anteriorly deflected, centrally, longitudinally strongly ridged, base concavely sinuate on each side, lateral margins very slightly rounded, posterior angles shortly



spinous, anterior margin a little excavate for the reception of the head; scutellum broad, subtriangular, about as long as broad at base, transversely impressed before apical area which is centrally longitudinally carinate; tegmina long and narrow, much longer than abdomen, valvate beyond clavus, three long apical cells, one or more small subapical cells beyond clavus (inconstant in number); legs very robust, excluding posterior femora longly spinulose, posterior femora strongly broadened and spinulose at their apices, tibiae moderately flattened and sulcate beneath.

Type *D. laudata*, Dist.

I have placed this genus provisionally in the *Gyponinæ*.

*Doda laudata*, sp. nov. (Pl. vii, figs. 9, 9a.)

Vertex, pronotum and scutellum black finely mottled with ochraceous, vertex more or less anteriorly ochraceous; pronotum with a greyish spot on the central carination; scutellum with a spot on each lateral margin and the apex greyish white, body beneath and legs black, basal area of face margined with ochraceous, and with two small greyish spots at base; anterior femora obscurely spotted with dull ochraceous beneath; tegmina black, largely spotted with white, the largest spots on costal and inner margins, some minute reddish-ochraceous spots on disk; wings pale fuliginous.

Long excl. tegm. 5 mm.; incl. tegm.  $8\frac{1}{2}$  mm.

Hab.—Siam, Malay States; Bukit Besar (Annandale and Robinson; Brit. Mus.), Borneo; Kuching (Hewitt).

### Sub-fam. Jassinæ.<sup>1</sup>

#### Genus HECALUS.

*Hecalus*, Stål, Ann. Soc. Ent. Fr. (4), iv, p. 65 (1864).

Type *H. paykulli*, Stål.

*Hecalus parvus*.

*Ledra parva*, Walk., List Hom., iii, p. 828 (1851).

*Selenocephalus parva*, Stål, Öfv. Vet.-Ak. Förh., 1862, p. 494.

Hab.—Hongkong.

#### Genus DABRESCUS.

*Dabrescus*, Stål, Öfv. Vet.-Ak. Förh., 1870, p. 738.

Type *D. remotus*, Walk.

*Dabrescus ineffectus*.

*Bythoscopus ineffectus*, Walk., List Hom. Suppl., p. 266 (1858).

Hab.—North China.

*Dabrescus metallicus*. (Pl. viii, figs. 12, 12a.)

*Bythoscopus metallicus*, Walk., Journ. Linn. Soc. Lond. Zool., i, p. 173 (1857).

Hab.—Borneo.

<sup>1</sup> Including the *Acocephalinæ*.

*Dabrescus lætisigna*.

*Bythoscopus lætisigna*, Walk., Journ. Linn. Soc. Lond. Zool., i,  
p. 174 (1857).

Hab.—Borneo.

*Dabrescus nigrilinea*.

*Bythoscopus nigrilinea*, Walk., Journ. Linn. Soc. Lond. Zool., i  
p. 174 (1857).

Hab.—Borneo.

*Dabrescus costalis*. (Pl. viii, figs. 8, 8a.)

Vertex ochraceous, the anterior margin narrowly black, and a transverse linear piceous spot before each eye; pronotum brownish ochraceous with thickly placed fine paler rugosities; scutellum dull obscure pale brownish; abdomen above piceous brown, base and apex of apical segment ochraceous, anal segment black; face pale castaneous, basal margin darker, followed by a transverse ochraceous line extended between the upper margins of eyes, the inner margins of eyes also ochraceous; cheeks piceous, their margins ochraceous; sternum piceous, its lateral margin broadly sulphur-yellow; abdomen beneath and legs ochraceous; tegmina pale brownish ochraceous, venation a little darker, costal margin ochraceous beneath which the costal area is piceous brown, a large greyish white costal spot before apex, apical margin fuscous brown; wings pale fuliginous with the veins darker.

Long excl. tegm., ♀, 6 mm. Exp. tegm. 16 mm.

Hab.—Borneo; Kuching (Hewitt).

#### Genus TARTESUS.

*Tartessus*, Stål, Öfv. Vet.-Ak. Förh., 1865, p. 156.

Type *T. ferrugineus*, Walk.

*Tartessus antecedens*.

*Bythoscopus antecedens*, Walk., Journ. Linn. Soc. Lond. Zool., x,  
p. 316 (1869).

*Bythoscopus bimarginatus*, Walk., *loc. cit.*, p. 318.

Hab.—Morty; New Guinea; Ceram.

This may prove to be but a synonym of *T. fieberi*, Stål, from Mysol.

*Tartessus polygrammus*. (Pl. viii, figs. 11, 11a.)

*Bythoscopus polygrammus*, Walk., Journ. Linn. Soc. Lond. Zool.,  
x, p. 317 (1869).

Hab.—N. Guinea; Morty.

*Tartessus bistriga*.

*Bythoscopus bistriga*, Walk., Journ. Linn. Soc. Lond. Zool., x,  
p. 317 (1869).

*Tartessus concolor*.

*Bythoscopus concolor*, Walk., Journ. Linn. Soc. Lond. Zool., x  
p. 317 (1869).

Hab.—Mysol.

*Tartessus basivitta.*

*Bythoscopus basivitta*, Walk., Journ. Linn. Soc. Lond. Zool., x,  
p. 318 (1869).

*Bythoscopus luteatus*, Walk., loc. cit., p. 319.

Hab.—Waigiou ; Mysol ; Sula.

*Tartessus dimidiatus.*

*Bythoscopus dimidiatus*, Walk., Journ. Linn. Soc. Lond. Zool., x,  
p. 319 (1869).

Hab.—Dorey.

*Tartessus colligatus.*

*Bythoscopus colligatus*, Walk., Journ. Linn. Soc. Lond., Zool., x,  
p. 319 (1869).

Hab.—New Guinea.

*Tartessus flavibasis.*

*Bythoscopus flavibasis*, Walk., Journ. Linn. Soc. Lond. Zool., x,  
p. 320 (1869).

Hab.—Aru.

*Tartessus diaphanus.*

*Bythoscopus diaphanus*, Walk., Journ. Linn. Soc. Lond. Zool., x,  
p. 321 (1869).

Hab.—New Guinea.

*Tartessus cupreipennis.*

*Bythoscopus cupreipennis*, Walk., Journ. Linn. Soc. Lond. Zool.,  
x, p. 321 (1869).

Hab.—New Guinea.

*Tartessus scabrifrons.*

*Bythoscopus scabrifrons*, Walk., Journ. Linn. Soc. Lond. Zool.,  
x, 321 (1869).

Hab.—New Guinea.

*Tartessus badius.*

*Bythoscopus badius*, Walk., Journ. Linn. Soc. Lond. Zool., x,  
p. 321 (1869).

Hab.—New Guinea.

*Tartessus semivenosus.*

*Bythoscopus semivenosus*, Walk., Journ. Linn. Soc. Lond. Zool.,  
x, p. 322 (1869).

Hab.—Celebes.

#### Genus BORDURIA, gen. nov.

General shape and form of *Tartessus* but differing by the face which is sub-elongately rounded, foveately depressed, and with its margins ridged ; tegmina veined as in *Tartessus*.

Type *B. impressa*, Walk.

*Borduria impressa*. (Pl. viii, figs. 13, 13a.)

*Bythoscopus impressus*, Walk., Journ. Linn. Soc. Lond. Zool.,  
x, p. 322 (1869).

Hab.—Batchian.

## Genus NORSIANA, nom. nov.

*Norsia*, Walk., Journ. Linn. Soc. Lond. Zool., x, p. 326 (1869),  
nom. *præocc.*

Type *N. flavidorsum*, Walk.

"Body slender. Head as broad as the thorax; vertex arched, nearly twice as broad as long; front flat, nearly horizontal, beneath the vertex. Seta of the antennæ rather shorter than the body. Scutum much arched" (Walker). Vertex with a distinct central impressed line, ocelli on anterior margin close to eyes; face narrowing to clypeus; pronotum with the lateral margins a little angulated, anteriorly convexly arched between the eyes, posteriorly truncate; scutellum flattened, transverse, a little deflected to the transverse impression before apical area; legs slender, posterior tibiæ longly spinose; tegmina with four apical and two narrow antepical cells.

*Norsiana flavidorsum* (pl. vii, figs. 12, 12a).

*Norsia flavidorsum*, Walk., Journ. Linn. Soc. Lond. Zool., x,  
p. 326 (1869); *dilecta*, Walk., MS.

Hab.—Mysol (Wallace; Brit. Mus.); N. Guinea.

A specimen labelled *dilecta*, Walk., from New Guinea is in the British Museum, but I have been unable to trace its description.

The species described by Walker as *Norsia fulvescens* is not a Jassid at all.

## Genus JASSUS.

*Jassus*, Fabr., Syst. Rhyng., p. 85 (1803).

*Cælidia*, Germ., Mag. Ent., iv, p. 75 (1821).

Type *J. nervosus*, Fabr.

*Jassus glabra*.

*Tettigonia glabra*, Walk., Journ. Linn. Soc. Lond. Zool., i, p. 168  
(1857).

Hab.—Borneo.

*Jassus inclinans*.

*Tettigonia inclinans*, Walk., Journ. Linn. Soc. Lond. Zool., i,  
p. 169 (1857).

*Cælidia cupraria*, Walk., loc. cit., p. 173.

*Cælidia marginifrons*, Walk., loc. cit., x, p. 310 (1869).

Hab.—Borneo; Mysol.

*Jassus albisigna*.

*Cælidia albisigna*, Walk., Journ. Linn. Soc. Lond. Zool., i, p. 173  
(1857).

Hab.—Borneo.

*Jassus pardalis*.

*Cælidia pardalis*, Walk., Journ. Linn. Soc. Lond. Zool., i, p. 173  
(1857).

Hab.—Borneo.

*Jassus dirigens*.

*Cælidia dirigens*, Walk., Journ. Linn. Soc. Lond. Zool., i, p. 172 (1857).

*Tettigonia multipars*, Walk., List Hom. Suppl., p. 220 (1858).

Hab.—Borneo ; Hongkong.

*Jassus guttivena*.

*Cælidia guttivena*, Walk., Journ. Linn. Soc. Lond. Zool., i, p. 99 (1856).

Hab.—Malacca.

*Jassus punctivena*.

*Cælidia punctivena*, Walk., Journ. Linn. Soc. Lond. Zool., i, p. 99 (1856).

Hab.—Malacca.

*Jassus diversus*.

*Cælidia diversa*, Walk., Journ. Linn. Soc. Lond. Zool., x, p. 309 (1869).

Hab.—Mysol ; New Guinea ; Waigiou.

*Jassus piceus*.

*Cælidia picea*, Walk., Journ. Linn. Soc. Lond. Zool., x, p. 309 (1869).

Hab.—Mysol.

*Jassus subnotatus*.

*Cælidia subnotata*, Walk., Journ. Linn. Soc. Lond. Zool., x, p. 309 (1869).

Hab.—Mysol.

*Jassus verticalis*.

*Cælidia verticalis*, Walk., Journ. Linn. Soc. Lond. Zool., x, p. 310 (1869).

Hab.—New Guinea.

*Jassus canifascia*.

*Cælidia canifascia*, Walk., Journ. Linn. Soc. Lond. Zool., x, p. 311 (1869).

Hab.—Morty.

*Jassus inscriptus*.

*Cælidia inscripta*, Walk., Journ. Linn. Soc. Lond. Zool., x, p. 311 (1869).

Hab.—Aru ; New Guinea.

*Jassus luteifascia*.

*Cælidia luteifascia*, Walk., Journ. Linn. Soc. Lond. Zool., x, p. 311 (1869).

*Cælidia unifasciata*, Walk., *loc. cit.*, p. 313.

Hab.—Mysol.

*Jassus rufivena*.

*Cælidia rufivena*, Walk., Journ. Linn. Soc. Lond. Zool., x, p. 312 (1869).

Hab.—Gilola, Sula.

*Jassus albipes*.

*Cælidia albipes*, Walk., Journ. Linn. Soc. Lond. Zool., x, p. 312 (1869).

Hab.—New Guinea.

*Jassus subapicalis*.

*Cælidia subapicalis*, Walk., Journ. Linn. Soc. Lond. Zool., x, p. 312 (1869).

Hab.—Mysol.

*Jassus roseifascia*.

*Cælidia roseifascia*, Walk., Journ. Linn. Soc. Lond. Zool., x, p. 315 (1869).

*Cælidia selecta*, Walk., *loc. cit.*

*Cælidia guttulosa*, Walk., MS.

Hab.—Mysol; Sula.

*Jassus maculiceps*.

*Cælidia maculiceps*, Walk., Journ. Linn. Soc. Lond. Zool., x, p. 315 (1869).

Hab.—Batchian.

*Jassus testaceus*.

*Cælidia testacea*, Walk., Journ. Linn. Soc. Lond. Zool., x, p. 315 (1869).

Hab.—Mysol.

*Jassus guttatus*.

*Cælidia guttata*, Walk., Journ. Linn. Soc. Lond. Zool., x, p. 313 (1869).

*Cælidia sexguttata*, Walk., *loc. cit.*, p. 314.

Var. *Cælidia terminalis*, Walk., *loc. cit.*, p. 314.

Hab.—Mysol; New Guinea.

The var. *terminalis*, Walk., has the tegmina without white spots, but their apices whitish as in the typical forms.

*Jassus brevis*.

*Tettigonia brevis*, Walk., List Hom., iii, p. 774 (1851).

*Cælidia brevis*, Stål, Ofv. Vet.-Ak. Förh., 1862, p. 494.

Hab.—Hongkong.

*Jassus dubia*.

*Tettigonia* ? *dubia*, Walk., List Hom., iii, p. 781 (1851).

*Cælidia dubia*, Stål, Ofv. Vet.-Ak. Förh., 1862, p. 494.

Hab.—Philippines.

*Jassus leucomelana*.

*Cælidia leucomelana*, Walk., Journ. Linn. Soc. Lond. Zool., x, p. 313 (1869).

Hab.—Mysol.

*Species in a more or less mutilated condition.*

*Jassus* ? *dorsimacula*.

*Cælidia dorsimacula*, Walk., Journ. Linn. Soc. Lond. Zool., x, p. 314 (1869).

Hab.—New Guinea.

*Jassus* ? *aurulenta*.

*Cælidia aurulenta*, Walk., Journ. Linn. Soc. Lond. Zool., x,  
p. 316 (1869).

Hab.—Morty.

Genus SCAPHOIDEUS.

*Scaphoideus*, Uhler, Trans. Maryl. Ac. Sci., 1888, p. 33.

Type *S. immistus*, Say.

*Scaphoideus literatus*, sp. nov. (Pl. vii, fig. 4.)]

Vertex greyish white, crossed in front of eyes with a transverse undulated black fascia, posterior margin of this fascia and inner margin of eyes purplish red, a rounded black spot at apex; pronotum dull greyish, the anterior margin and two transverse discal spots ochraceous; scutellum ochraceously spotted on basal half, the apical half greyish white; face flavescent, with numerous transverse black lines, the basal margin narrowly white; body beneath and legs pale ochraceous, posterior tibiæ spotted with black; tegmina pale flavescent, the veins piceous, two white spots on claval suture, two white spots at base of clavus, two discal white spots, and a spot of the same colour near apex of costal margin, apex greyish margined with piceous; vertex strongly angulate anteriorly, longer than breadth between eyes.

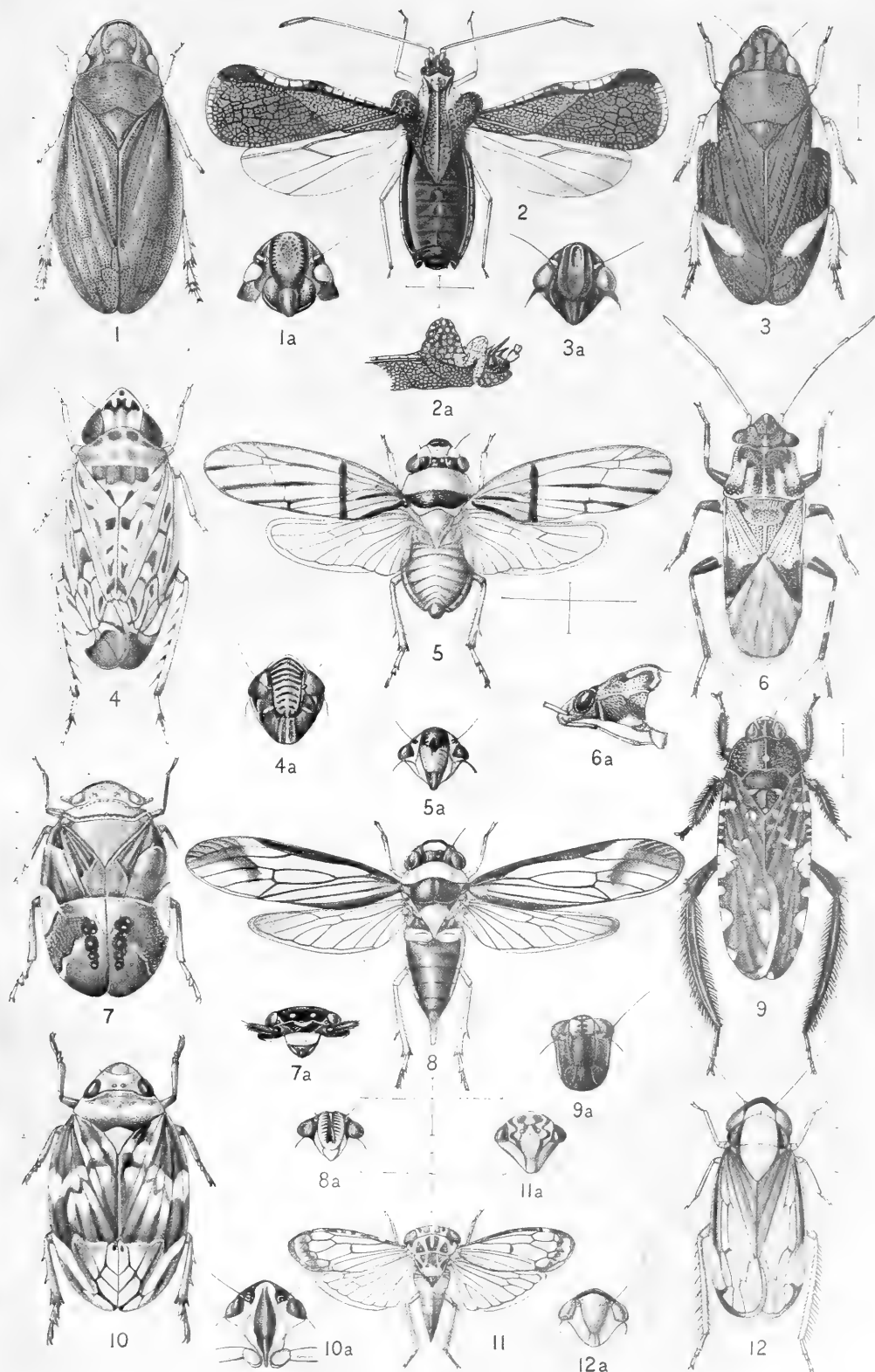
Long incl. tegm.  $4\frac{1}{2}$  mm.

Hab.—Borneo; Kuching (Hewitt).









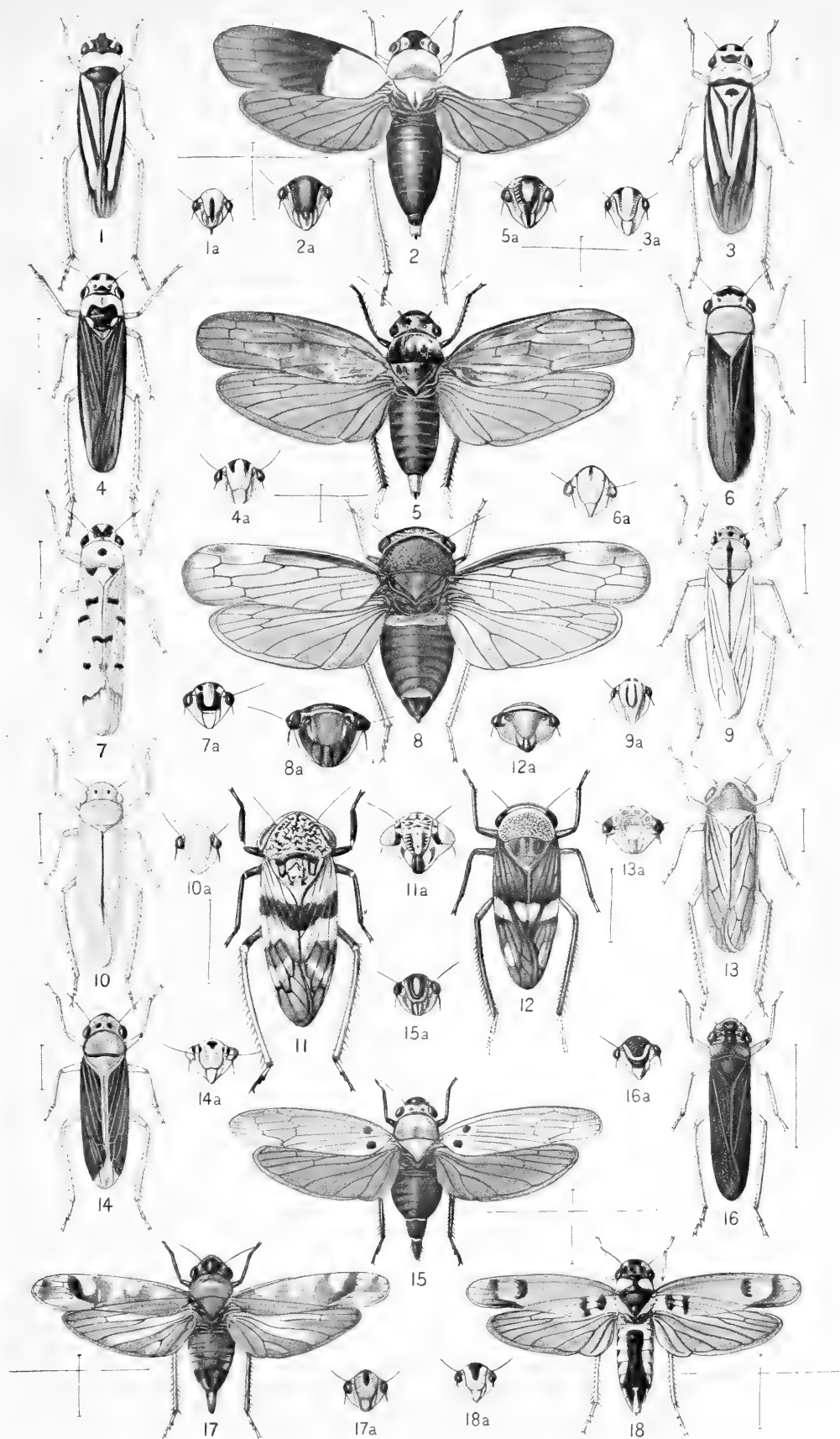
Horace Knight, del.

West, Newman proc.

1. DINDA MAURA.
2. ELASMOGNATHUS HEWETTI.
3. LORA INCLYTA.
4. SCAPHOIDEUS LITERATUS.
5. AUFIDUS SPECTABILIS.
6. DINOMACHUS FUSUS.

7. HILDA MALAYENSIS.
8. COLSA MATANGA.
9. DODA LAUDATA.
10. EUCLOVIA CONVEXA.
11. CHUNRA GIGANTEA.
12. NORSIA FLAVIDORSUM.





Horace Knight, del.

West. Newman proc.

- |                  |              |                  |             |                   |           |
|------------------|--------------|------------------|-------------|-------------------|-----------|
| 1. TETTIGONIELLA | TAMBORENSIS. | 7. TETTIGONIELLA | ANNANDALEI. | 13. BORDURIA      | IMPRESSA. |
| 2. "             | ERICHSONI.   | 8. DABRESCUS     | COSTALIS.   | 14. KOLLA         | POLITA.   |
| 3. "             | TIMORENSIS.  | 9. TETTIGONIELLA | WHITEHEADI  | 15. TETTIGONIELLA | RAMANA.   |



## XVI.—*CIMEX ROTUNDATUS*, SIGNORET.

By CAPTAIN W. S. PATTON, I.M.S., *Membre Correspondant*,  
*Société de Pathologie Exotique* (Paris); *King Institute*  
*of Preventive Medicine*, Madras.

A reference to the extensive literature on the bed-bug would lead one to suppose there was nothing new to be learnt about this insect, but Mr. A. Arsène Girault,<sup>1</sup> who is at present compiling a complete bibliography of the bed-bug, some five hundred odd papers, states that the majority of the accounts are of little value and are merely re-compilations; it is, however, surprising to find that erroneous statements regarding the habits of this pest still exist in modern text-books on parasitology. These errors are obviously due to the fact that the writers have compiled their information from old and faulty sources and have not themselves verified the statements of the earlier entomologists. I<sup>2</sup> recently pointed out that in addition to the misleading and loose statements regarding the habits of this insect, very little was known of the species associated with man. Medical men and others who have conducted experiments with the bed-bug often speak of it by a general name, *bug* in English, *Wanze* in German, and *punaise* in French; the conclusions drawn from such experiments must therefore lead to confusion, and very little value can be attached to them. The reason for this inaccuracy is not far to seek: *Cimex lectularius*, Linnæus, is the only well-known species; *Cimex ciliatus*, Eversmann, *Cimex rotundatus*, Signoret, and *Cimex macrocephalus*, Fieber, are so imperfectly known that the majority of investigators take it for granted that *Cimex lectularius* is the only bed-bug, the others being very doubtful species; for this reason the scientific name is often omitted.

Two years ago, when conducting my experiments on the bed-bug of Madras, I considered it was *Cimex lectularius*, Linnæus, as the only available literature<sup>3</sup> on the subject described this bug as occurring throughout British India and Ceylon; while *Cimex macrocephalus*, Fieber, was only known from Bhamo (Burma). As the description of *lectularius* did not, however, tally with that of the Madras bug, I obtained some living specimens of *lectularius*, Linnæus, from

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<sup>1</sup> A. Arsène Girault, *Psyche*, June-August 1905, December 1905, April-June 1906; *Journal of the American Medical Association*, July 14, 1908; "A Bibliography of the Bed-bug, *Cimex lectularius*, Linnæus," *Zoologische Annalen*, 1908.

<sup>2</sup> Patton, *Indian Medical Gazette*, February 1907.

<sup>3</sup> Distant, *Fauna of British India—Rhynchota*, vol. ii.

London, and at once found the local bug was not the same. About that time I sent some specimens to Mr. Distant, who kindly informed me they were *macrocephalus*, Fieber. In order, therefore, to find out whether *lectularius* did really occur in India, I obtained, through the civil and medical authorities, a very large collection of bugs from all parts of India, Burma, Assam, and the Malay Archipelago. As a result of the examination of these specimens it was found the Indian bed-bug was *macrocephalus*, and that *lectularius*, as far as I was able to ascertain, is limited to the North-West Frontier Province and the Kurram Valley. In the recent English edition of Braun's work, *macrocephalus* is not mentioned, but *rotundatus*, the bed-bug of the Island of Réunion, is described as a variety of *lectularius*. On reading Signoret's<sup>1</sup> description of *rotundatus*, I was struck with some important differences between it and *lectularius*; in fact Signoret gave an exact description of *macrocephalus*. Dr. Barbeau, Director of the Medical and Health Departments of the Island of Mauritius, to whom I applied for bed-bugs, kindly sent me a valuable collection from the Island, and through his French colleagues obtained many hundreds from Réunion. I was thus able to settle with certainty that the bed-bug of Mauritius and Réunion is identical with *macrocephalus* of Fieber; and as Signoret described it before Fieber, I have adopted the name *Cimex rotundatus* for the Indian bed-bug. Continuing my investigations of the two species *lectularius* and *rotundatus*, I have found that the former is distributed chiefly throughout the temperate zones while the latter is a tropical or subtropical species. I have recently had *rotundatus* sent to me from the West Indies where, as in the case of Mauritius, it was most probably introduced by Indian coolies; it also occurs in the Congo (specimens kindly sent me by Dr. C. Wellmann) and Sierra Leone.

As is well known, the family *Cimicidæ*, which contains four genera—*Cimex*, *Æciacus*, *Cocadumus*, and *Hematosiphon*—belongs to the *Heteroptera*, a sub-order of the *Rhynchota*, and comes between the two families *Phymatidæ* and *Ceratocombidæ*. The genus *Cimex* contains four species—*Cimex lectularius*, Linnaeus; *Cimex rotundatus*, Signoret; *Cimex columbarius*, Jenyns; and *Cimex pipistrelli*, Jenyns. All the species have the following characters: They are flat, reddish-brown insects, with a short, broad head containing two large eyes but no ocelli. The thorax, or more correctly the prothorax, is semilunar in shape, with its anterior angles extended; the elytra or wing pads are rudimentary, and lie over the metathorax. The abdomen consists of seven segments and an eighth or anal appendage; the legs are slender, the anterior tibiæ more than three times as long as the tarsi, which are three-jointed. The proboscis is flexed in a groove beneath the head and prothorax.

*Cimex rotundatus*, Signoret (plate xiii, figs. 1 and 2), is of a dark mahogany colour, and differs from the type species *lectularius*,

<sup>1</sup> Signoret, V., "Notice sur quelq. Hémipt. nouv.," *Annales Soc. Entomol. France*, 1852, x, p. 539.

*Linnæus* (figs. 3 and 4), in the following respects: *its head is not as long or as broad as that of lectularius*; *its prothorax, which is also narrower and shorter, is rounded to the margin, and quite unlike that of the type species, whose prothorax is raised in the centre but flattened abruptly at a line a little beyond the level of the eyes.* The abdomen of *Cimex rotundatus* is less orbicular and broadest at the second segment, whereas that of *lectularius* is broadest at the third segment.

These are the chief points by which the two bugs can be distinguished, and a reference to the drawings accompanying this paper will at once help anyone to identify them. Mr. Maxwell-Lefroy,<sup>1</sup> in a recent paper, doubts the validity of the two species *lectularius* and *rotundatus*, and states their distribution is imperfectly known. I can only refer him to the typical specimens I have sent him and to my paper on the distribution of the two species. I have not yet seen *Cimex ciliatus*, Eversmann, which is said to occur in Russia (Kasan); Eversmann's<sup>2</sup> description suggests *Cimex columbarius*, Jenyns.

*Cimex rotundatus*, Signoret, is chiefly associated with man; but I have had a number of specimens taken in Madras from the yellow bat *Scotophilus kuhli*, which also harboured *Cimex pipistrelli*, Jenyns; the latter species, as far as I am aware, has not been recorded from India before. The Indian bed-bug, I find, will feed on any animal in the absence of man, and I once placed some on the small *Pipistrelle*, *P. abramus*, which always roosted in one particular part of a punkah in my study. The bugs, after gorging, left the bat and secreted themselves in the punkah, returning to the bat when it came back early in the morning. The host relations of this bug are therefore of some importance. *Cimex rotundatus* breeds throughout the year in India and abounds in all native houses and other places frequented by natives, such as Government offices, tram-cars, railway stations and carriages. The bugs are carried about in clothes, bedding, books and furniture. The habits and life-history are at present being investigated, as well as the best method of destroying the bugs; and the results, I hope, will be communicated later.

I shall always be glad to get specimens of bed-bugs from India and other parts of the world; the distribution of *lectularius* in North India requires to be worked out more carefully as well as that of *rotundatus* in Africa where Kala Azar exists. Bugs are best sent alive in a little tin box, the lid of which has been perforated; dead bugs must be put into spirit.

<sup>1</sup> Maxwell-Lefroy, *A preliminary account of the biting flies of India*, 1907.

<sup>2</sup> Eversmann, E., "Quædam insectorum species novæ," *Bulletin Soc. Impér. Nat.*, Moscow, 1841, xiv.



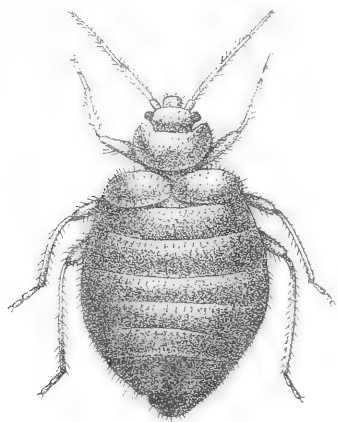




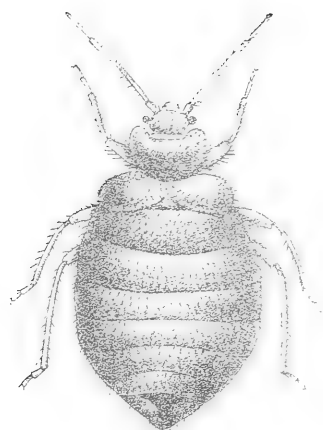
#### EXPLANATION OF PLATE XIII.

- FIG. 1.—*Cimex rotundatus*, Sign., ♂, from Madras,  $\times 8$ .  
,, 2.—*Cimex rotundatus*, Sign., ♀, from Burma,  $\times 8$ .  
,, 3.—*Cimex lectularius*, Linn., ♂, from Kurram, North  
India,  $\times 8$ .  
,, 4.—*Cimex lectularius*, Linn., ♀, from London,  $\times 8$ .  
,, 5.—Ventral surface of *Cimex rotundatus*, showing the flexed  
position of the proboscis,  $\times 13$ .

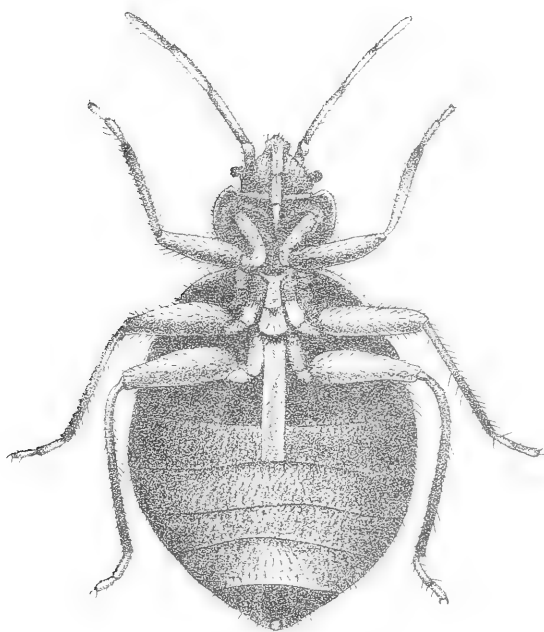
Figures 1 to 4 are drawn from accurate measurements of fresh specimens.



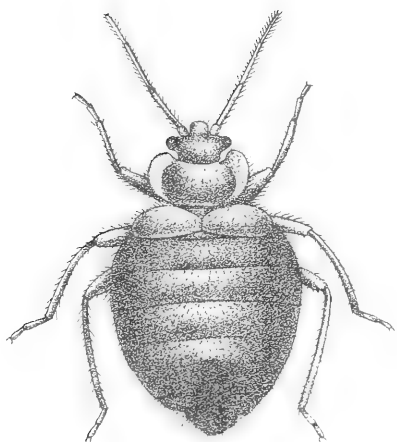
*Fig 1*



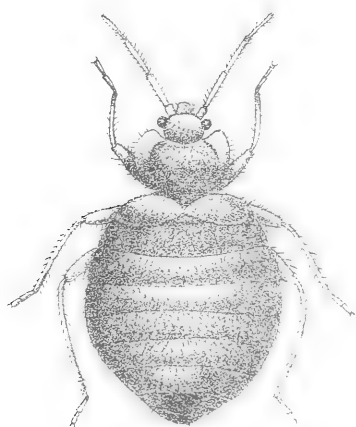
*Fig 2*



*Fig 5*



*Fig 3.*



*Fig 4*



## XVII.—NOTES ON FRESHWATER SPONGES.

By N. ANNANDALE, D.Sc., *Superintendent, Indian Museum.*

### IX.—PRELIMINARY NOTICE OF A COLLECTION FROM BURMA, WITH THE DESCRIPTION OF A NEW SPECIES OF *Tubella*.

The collection, of which this paper forms a preliminary account, was made by myself and a native collector in Rangoon and in the Amherst district of Tenasserim during the latter half of February and the first half of March of the present year. The following species were found:—

*Spongilla proliferens*, mihi, in ponds at Rangoon and in a lake at Kawkareik, Amherst district.

„ *carteri*, Bwk., in ponds at Rangoon and (gemmules) on the surface of the lake at Kawkareik.

*Ephydatia indica*, mihi, in the Moulmein waterworks and in a jungle pool near Kawkareik.

*Trochospongilla latouchiana*, mihi, in the lake at Kawkareik.

„ *phillottiana*, mihi, in a jungle pool near Kawkareik.

*Tubella vesparioides*, sp. nov., in the Kanglyi ( “ great pond ” ) at Mudon, near Moulmein, Amherst district.

The only other form known from Burma is Kirkpatrick's *Spongilla loricata* var. *burmanica*, which was described in the last number of these *Records* (vol. ii, p. 97). Thus, five out of the seven species now known from the province are also common in Lower Bengal, while only two, both widely distributed forms, have been found in Western India.

The new species of *Tubella*, of which a diagnosis follows, is closely related to *T. vesparium* (Martens) from Borneo, differing from this species in its smooth, amphioxous skeleton spicule and in the deeply indented rotule of its gemmule spicule.

*Tubella vesparioides*, sp. nov.

Closely related to *T. vesparium* (Marts.).

Sponge massive, without branches, hard but brittle, almost black in colour (dry); the surface covered with a network of stout spicule fibres, the interstices of which are more or less deeply sunk, with sharp fibres projecting vertically upwards at the nodes; the whole mass pervaded by a similar network, which is composed of a considerable number of spicules lying parallel to one another, overlapping at the ends and bound together by a profuse secretion of spongin. Skeleton spicules rather

stout, smooth, amphioxious, bent in a wide arc or, not infrequently, at an angle. No true flesh spicules. Gemmule spicules terminating above in a rounded, knoblike structure and below in a relatively broad, flat rotule, which is very deeply and irregularly indented round the edge when mature, the spicule having the form of a sharp pin with a round head at an earlier stage of development; shaft of adult spicules projecting slightly below the rotule, long, slender, generally armed with a few stout conical spines, which stand out at right angles to it. Gemmules numerous throughout the sponge, spherical, provided with a short, straight foraminal tubule, surrounded by one row of spicules, which are embedded in a rather thin granular coat.

Average length of skeleton spicule	..	0.316	mm.
„ breadth of skeleton spicule	..	0.0135	„
„ length of gemmule spicule	..	0.046	„
„ diameter of rotule ..	..	0.0162	„
„ diameter of gemmule ..	..	0.446	„

XVIII.—ON THE FRUIT BATS OF THE  
GENUS *PTEROPUS* INHABITING THE  
ANDAMAN AND NICOBAR ARCHIPE-  
LAGOS, WITH THE DESCRIPTION OF  
A NEW SPECIES.

By GEO. E. MASON.

Having recently had occasion to examine the species of *Pteropus* recorded from the Andaman and Nicobar Archipelagos, with the object of ascertaining what may be regarded as established facts respecting the differentiation and distribution of the recognised forms, and finding, as the result of my studies, that many of the doubtful references in relation to the synonymy of the several species are not only thereby corrected, but have likewise furnished much additional data in respect to their range of distribution, I have, upon careful consideration, deemed it expedient to place on record the conclusions at which I arrived, the liberal material at my command having offered exceptional opportunities for the carrying out of this object. One species hitherto confounded with the large Malayan Kalong I have been obliged to describe as new.

Five well-defined and characteristic species of *Pteropus* are now known to occur in the Nicobar and Andaman Archipelagos, three of them, we may conclude, being peculiar to the islands, and the remaining two only occurring as stragglers; one of these latter species, *viz.*, *Pteropus celæno* (= *edulis*), however, should possibly be regarded as a regular migrant during the monsoons.

*Pteropus melanotus*, Blyth.

1846. *Pteropus edulis*, Blyth, *Journ. Asiat. Soc. Bengal*, xv, p. 367.  
1861. *Pteropus nicobaricus*, Fitzinger, *Sitzungsber. Math. Natur-  
wissensch. Cl. Kais. Akad. Wissensch., Wien*, xlii (1860),  
p. 389, 1861 (*nomen nudum*).  
1863. *Pteropus melanotus*, Blyth, *Cat. Mammal. Mus. Asiat. Soc.  
Bengal*, p. 20 (*nomen nudum*).  
1869. *Pteropus nicobaricus*, Zelebor, *Reise der Oesterreichischen  
Fregatte Novara, Zool.*, i (Wirbelthiere), 1, Mamm., p. 11.

From a brief passage occurring in one of a series of letters<sup>1</sup> written by the Rev. John Gottfried Haensel, a missionary of the

<sup>1</sup> Letters on the Nicobar Islands, their Natural Productions, and the Manners, Customs, and Superstitions of the Natives, etc., etc. Addressed by the Rev. John Gottfried Haensel (the only surviving missionary), to the Rev. C. J. Latrobe, 1812.

Church of the United Brethren, descriptive of the ethnology and natural productions of the Nicobar Islands, observed during a residence of eight years in the group (1779-1787), and also from the widely scattered references to be met with in the journals of later observers, we have long known that the rank and luxuriant forests which clothe a greater part of the numerous islands comprising this archipelago, have afforded subsistence to at least one representative of the family of large frugivorous bats belonging to the genus *Pteropus*. Fitzinger, however, in 1861 (*Sitzungsb. Wien Akad.*, p. 389) was the first writer to recognise this bat as a distinct species by name, specimens having reached Vienna, together with other material collected in Car-Nicobar by the naturalists attached to the Austrian exploratory expedition of the frigate "Novara" in 1858. Although Fitzinger assigned the name of *Pteropus nicobaricus* to this bat, no details of the specific characters which constituted the species were given until Zelebor<sup>1</sup> published his exhaustive, though scarcely diagnostic, description in 1869.

It should, however, be remembered that prior to the publication of Fitzinger and Zelebor's name and description, specimens of the same Nicobarian bat had been deposited in the Museum of the Asiatic Society of Bengal so long ago as 1846 by Captain H. Lewis, the examples being contained in a collection made during a cruise of the schooner "L'Espiegle" in the previous year, amongst the islands of the Nicobar Archipelago; and this collection, supplemented by additional material bequeathed to the Museum of the Society by the Rev. J. Barbe, formed together the subject of a paper by Blyth in the *Journal of the Asiatic Society of Bengal* (vol. xv, 1846, p. 367), descriptive of the vertebrated fauna of the Nicobar Islands; and we may here conveniently give the following transcription taken from his original description of the bats contained in the collection:—

"*Pteropus edulis*, *Pt. javanicus*, Horsf., etc., etc.—Three specimens are alike remarkable for having the throat and front of the neck black, the head blackish, the nape dull reddish-brown, the back shining black, flanks and vent dull black, and the rest of the under-parts dull reddish-brown, much paler in the centre."

The detailed form of this notice would lead us to infer that Blyth was constrained to include these specimens under this title, although the differentiation of the examples in form and colour must have strongly impressed him at the time he compiled his article. When seventeen years later he published the *Catalogue of Mammalia in the Museum of the Asiatic Society of Bengal* (1863), these original specimens of Captain Lewis's received specific distinction under the name of *Pteropus melanotus*. Immediately following the publication of the Catalogue, Dr. Frederick J. Mouat's book of *Adventures and Researches among the Andaman Islands* was issued, with a zoological appendix contributed by Blyth; and in an

<sup>1</sup> *Reise der Oester. Freg. Novara*, Säugethiere, p. 11.



introductory note we learn that a "species" (of *Pteropus*) "is common in the Nicobars which is styled *Pteropus nicobaricus* by the naturalists of the 'Novara' expedition, and *Pt. melanotus* in the *Catalogue of the Mammalia in the Museum of the Asiatic Society*." Proceeding, Mr. Blyth, in a succeeding passage, admits that he is unacquainted with the literature describing the discoveries of the Austrian expedition.

Through the courtesy of Dr. Annandale, the Superintendent of the Indian Museum, Calcutta, I have been enabled to examine one of Captain Lewis's specimens, which is also one of the originals of Blyth's first and early description of 1846, and likewise the type specimen of his *Pteropus melanotus* of 1863. The example agrees perfectly in all its essential characters with the *Pteropus nicobaricus* described by Zelebor in 1869. Under these circumstances it is evident, therefore, Zelebor's name can no longer be employed for this species, except as a synonym, having been for many years, as I have shown, superseded by the published description of Blyth in 1846. The species must, in consequence, now stand as *Pteropus melanotus*, Blyth. This revision is, I believe, in accord with the views of Dr. Gerrit Miller, Jr., who first directed attention to the ambiguousness of the earlier identifications.

The bat described by Peters as *Pteropus condorensis*<sup>1</sup> has been referred by Dobson to this species (*Monograph of the Asiatic Chiroptera*, 1876, p. 18). Although related to *Pt. melanotus* in some characters, it is quite a distinct and characteristic form, confined to the distant island of Pulo Condor in the China Sea, lying off the Annamese coast, about lat. 8° 40' N., long. 106° 42' E. Some of the small islands adjoining the Acheen coast of Sumatra (Pulo Way, Pulo Brasse, etc.) have, I think, been confounded by Dobson with this far-off island, his references in the habitat given for *Pteropus nicobaricus* in the *Monograph of the Asiatic Chiroptera* leading one to this inference. That these islands are inhabited by a species of *Pteropus* we possess ample evidence. It also occurs on the mainland, and what I take to be the same species has been recorded as far south as Nias Island. I cannot, however, agree as to the specific identity of these bats with *Pteropus melanotus* (= *nicobaricus*), which, I think it will be found, is peculiar to the Nicobar group, while the Sumatran bat is a not yet differentiated species. To decide this point, however, it will be necessary to acquire a far larger and more representative collection of specimens than is at present available for study.

Both male and female specimens of *Pteropus melanotus* closely resemble one another in the coloration of the fur, exhibiting but little variation from that which was so accurately recorded by Blyth,<sup>2</sup> and described later, in much more detail, by Dr. G. Miller, Jr.,<sup>3</sup> differing greatly in this respect from the following species,

<sup>1</sup> *M. B. Akad., Berlin*, 1869, p. 393.

<sup>2</sup> *Journ. Asiat. Soc. Bengal*, xv, p. 367.

<sup>3</sup> *Proc. U. S. Nat. Mus.*, xxiv, p. 784.

about to be described, of which the two sexes might readily be mistaken at first sight for distinct species.

TABLE OF MEASUREMENTS OF *Pteropus melanotus*.

	Head and body.	Tibia.	Foot.	Calcar.	Forearm.	Thumb.	Second digit.	Third digit.	Fourth digit.	Fifth digit.	Ear from meatus.	Ear from crown.	Width of ear.
	Mm.	Mm.	Mm.	Mm.	Mm.	Mm.	Mm.	Mm.	Mm.	Mm.	Mm.	Mm.	Mm.
Blyth's type (female).	266	65	46	13	148	65	110	278	215	189	28	23	15
Male, Galatea River, Gt. Nicobar.	273	77	52	14	163	72	116	280	225	190	30	25	18
Female, Galatea River, Gt. Nicobar.	283	78	45	16	170	75	120	293	223	202	30	23	21

*Pteropus tylleri*, sp. nov.

*Pteropus tylleri*, Blyth, in litt.

1873. *Pteropus nicobaricus*, Dobson. *Journ. Asiat. Soc. Bengal*, xlii, pt. 2, p. 198 (*partim*).  
 1876. *Pteropus nicobaricus*, Dobson, *Monogr. Asiat. Chiropt.*, p. 17 (*partim*).  
 1878. *Pteropus nicobaricus*, Dobson, *Cat. Chiropt. B. M.*, p. 54 (*partim*).  
 1891. *Pteropus nicobaricus*, Blanford, *Fauna Brit. Ind. Mamm.*, p. 260 (*partim*).

Again, quoting from the appendix to Dr. Mouat's *Adventures and Researches among the Andaman Islands* (1863), p. 353, attention is directed by Blyth to the entire absence of any representative of the genus *Pteropus* in the Andaman group, although the species, *Pteropus melanotus*, as we have seen, is frequent on most of the islands comprised in the adjacent Nicobar Archipelago.

In the year 1864, however, Lieut.-Colonel R. C. Tytler, the Officiating Governor at the Port Blair Penal Settlement, who contributed largely to our knowledge of the fauna of the Archipelago during his term of residence, transmitted to the Museum of the Asiatic Society the first authentic specimens of an Andamanese *Pteropus* procured in the neighbourhood of the Settlement; and Blyth, who examined the specimens, found he was unable to refer them to any existing species of the genus, and accordingly adopted the MS. and unpublished name of *Pteropus tylleri*, for the species. The original labels, in Blyth's handwriting, are still attached to the specimens.

The present form is a most distinct and good species, bearing some resemblance to *Pteropus celæno* in colour only; and it is owing to this fact, I believe, its supposed identity with that well-known and widely distributed form has been generally accepted, and the specific distinction of the species so long ignored. As a matter of fact *Pteropus celæno* is only a straggler in the Nicobars, and appears to be absent altogether from the whole of the Andaman Islands, all records which have come to us being really founded upon examples of the species now under discussion. From these circumstances it will not perhaps appear so much a matter of speculation that such a characteristic and well-defined type should have escaped earlier notice.

Dobson, in his paper "On the Pteropidæ of India and its Islands" (*Journ. Asiat. Soc. Bengal*, xlii (1873), p. 198), very correctly expressed much doubt as to whether he was not at fault in associating under the one name both the Nicobar and Andamanese bat; he even went so far as to submit examples to Professor Peters. The vague statement furnished by that authority "that they agree in the form of the ear and feet" with Zelebor's type in the Vienna Museum led him, we are told, to accept unreservedly this view also, and to unite the two forms. Had he had before him a representative series of specimens he could scarcely have failed to realize the error of a conclusion based as it was upon such slight and unstable characters.

This species is generally distributed among the islands of the Andaman group; the stretch of ocean known as Ten-Degree Channel, separating Little Andaman from Car-Nicobar, forms its southern barrier. Dr. Anderson was in error when he extended its range to the Nicobars. Through the kindness of Dr. Annandale I have been enabled to examine the original skin, No. 92 f. of the Catalogue, which Anderson records as black, with the nape faintly chestnut, and as coming from the South Nicobars; it fortunately still retains Blyth's label, and this shows Dr. Anderson wrongly transcribed the locality he attributed to it. The specimen is one which was contained in the original collection formed by Lieut.-Colonel Tytler, and is, like the rest of the examples in the series, from the Andamans, as the label testifies. *Pteropus tytleri* occurs on Barren Island, where it shows a tendency to deteriorate in size and further deviates from specimens collected in the type locality by having a light and conspicuous oval-shaped area of greyish hairs occupying the chest and stomach. This is the first recorded instance, I believe, of any species of *Pteropus* having been taken on Barren Island; the specimens were collected by Mr. B. B. Osmaston.

*Description of the type, an adult male (skin), collected on Rutland Island, South Andamans, March 5th, 1907, by Mr. B. B. Osmaston.*

Ears of medium length, naked, projecting much beyond the short fur; their anterior and posterior edges nearly equally concave, finishing with a bluntly-pointed tip. The whole of the head,

throat and under parts deep black; posterior back black, the fur closely adpressed, 40 mm. broad at the narrowest parts; muzzle black, sparingly covered with hair; mantle conspicuous and well defined, a dark canary, changing to orange at the margins and weakly developed orange-coloured tufts on shoulder glands. Fore-limbs and membranes nearly naked above, a few hairs only extending along the upper side of the humerus and forearm; upper and posterior sides of thighs very furry; lower legs naked. Below, the fur sparingly covers the antebrachial membrane, the humerus, femur, and the wing-membrane internal to them, and also passes along the outer side of the forearms in a narrow band of weakly-developed hair. The uropatagium membrane is well developed but entirely concealed by the fur between the knees and body.

The general characters of the teeth are the same as in *Pteropus melanotus*,—strong and heavy, with well-developed basal cusps. Anterior upper premolar minute, other premolars produced horizontally, their length equal to once-and-a-half their breadth. Last molars above and below large and well developed, above more than one-half and below scarcely one-half of the penultimate molars. Anterior lower premolar of equal size to last molar, separated from the canine and next premolar by diastemata each equal to its own diameter.

*Skull*.—Greatest length, 70 mm.; condylobasal length, 63; basilar length, 61; median palate length, 37; palatal breadth between anterior molars, 13; zygomata breadth, 36; least interorbital breadth, 10.5; breadth between tips of postorbital processes, 28; greatest breadth of brain case above roots of zygomata, 23.8; greatest depth of brain case, 18; occipital depth, 12; depth of rostrum at middle of diastema, 10; mandible, 58; maxillary tooth row exclusive of incisors (alveoli), 28; mandibular tooth row exclusive of incisors (alveoli), 31.

The dimensions of this specimen will be found in the table of measurements.

An old female from the type locality is intensely black throughout, the head inclined to greyish, and the mantle only very faintly distinguishable; with other specimens it is more conspicuous, but in no case so strong in colour as the males. The individual variation in a series is very great, scarcely any two being alike; a very young example, with head and body only 140 mm., shows the bright collar very clearly, which is produced and completely encircles the throat.

A skin in my collection, from Little Jolly Boy Island, that was collected by Hume in 1873 and referred to *Pt. nicobaricus*, belongs to the present species.

TABLE OF MEASUREMENTS OF *Pteropus tytleri*.

	Head and body.	Tibia.	Foot.	Calcar.	Forearm.	Thumb.	Second digit.	Third digit.	Fourth digit.	Fifth digit.	Ear from meatus.	Ear from crown.	Width of ear.
	Mm.	Mm.	Mm.	Mm.	Mm.	Mm.	Mm.	Mm.	Mm.	Mm.	Mm.	Mm.	Mm.
Male (type) Rutland Island.	275	68	46	15	150	70	113	300	237	217	34	29	19
Female, Rutland Island.	277	74	48	14	148	85	113	299	232	209	34	28	19
No. 92 f. Indian Museum (Tytlér, 1864).	261	71	36	12	125	55	110	300	225	..	32	23	16
Male, Barren Island.	250	66	40	13	165	66	110	283	221	197	25	20	17
Female, Barren Island.	257	63	36	12	160	55	105	254	205	190	22	17	17

*Pteropus celæno*.

1758. *Vespertio vampyrus*, Linn., *Syst. Nat.*, Ed. x, 1, p. 31 (*partim*).

1804. *Vespertio celæno*, Hermann, *Observ. Zool.*, 1, p. 13.

1810. *Pteropus edulis*, Geoffroy, *Ann. Mus.*, xv, p. 90.

This species ranges throughout the Nicobar Island as a migrant, but has a very local distribution, arriving generally during April at the commencement of the south-west monsoon and leaving again about September. The naturalists attached to the "Novara" expedition, however, met with it on Car-Nicobar during their stay in February and March, which shows a general exodus of the species does not take place. I have no record of this form extending its range into the Andamans, although I have made special enquiries for it.

I examined a skull from the Mergui Archipelago which has been attributed to *Pteropus nicobaricus*; it proved, however, to be a characteristic specimen of the species now under review.

*Pteropus medius*.

1827. *Pteropus medius*, Temm., *Monog. Mammal.*, 1, p. 176.

The Indian Flying Fox occurs in the Andamans as an occasional and rare straggler, and has only been met with at two points on North Andaman Island—Reef Inlet, and in the neighbourhood of Cape Price.

It is, I believe, unknown in the Nicobar Archipelago.

*Pteropus faunulus.*

1902. *Pteropus faunulus*, Miller, *Proc. U. S. Nat. Mus.*, xxiv, p. 785.

I can add little to Dr. Miller's excellent description of this interesting form. The only specimen I have examined belongs to the same sex (male) as the type specimen, with which it closely agrees in all essential details. The forearm, however, measures 121 mm.

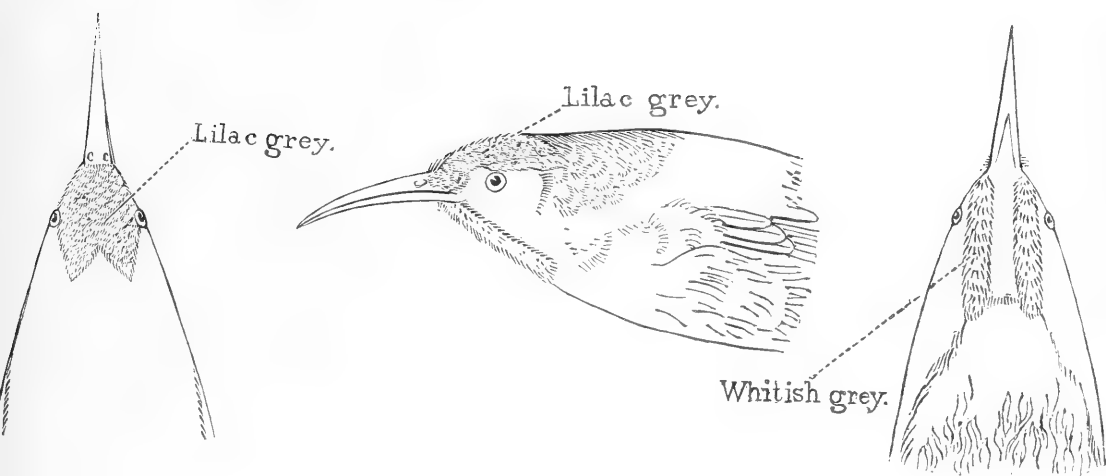
Of the habits of this bat I could gain little information; it feeds principally upon plantains, shaddock, and papaya, and only occurs in small parties of twos and threes. When disturbed it clings immovably to the under sides of the leaf or bough upon which it may be resting, showing no sign of life when its means of support is violently disturbed, or the animal itself actually touched.

In conclusion I beg to acknowledge the most kind assistance rendered me by Major W. Browning and Mr. B. B. Osmaston, and also by Dr. Lorenz, of the Naturhistorisches Hofmuseum, Vienna, who forwarded the type specimen of *Pteropus nicobaricus* to London for my inspection.

XIX.—A NEW SPECIES OF SUN-BIRD  
(*ÆTHOPYGA*) OBTAINED NEAR  
DARJILING, BRITISH  
SIK HIM.

By T. BENTHAM, *Indian Museum.*

This specimen was shot by myself, together with two examples of *Æthopyga nepalensis* (the Nepal Yellow-backed Sun-Bird), in the forest at Ghoom, near Darjiling. It differs in several strongly-marked points from *Æ. nepalensis*. A coloured drawing of the specimen was submitted to Capt. Walton some time ago, and that gentleman, who is well known as an authority on the birds of Sikhim, said that in his belief the bird was probably a new species. I propose, therefore, to call it *Æthopyga griseiceps*, Benth. (the



Grey-headed Sun-Bird), the grey head being the chief point in which it differs from other Indian Sun-Birds. The symmetry and regularity of the pale markings on the head and throat render it improbable that these markings are due to immaturity.

*Description—*

Forehead and crown dull lilac-grey, each feather with a dull buff centre spot; nape, hind neck, chin and throat, metallic green; sides of head dull black; a broad whitish grey moustachial streak on each side of the throat extending from the base of the bill to the yellow of the breast and dividing the green of the throat from the black of the side of the head. The rest of the plumage as in *Æ. nepalensis*.

Length 5·5"; tail 2·5"; wing 2·1"; tarsus ·55"; bill from gape ·9".



## XX.—THREE INDIAN PHYLACTOLÆMATA.

By N. ANNANDALE, D.Sc., Superintendent, Indian Museum.

### *Plumatella bombayensis*, sp. nov.

Allied to *P. tanganyikæ*, Rousselet.

Zoecia short, stout, with thick walls, closely adherent to and even embedded in solid objects, densely pigmented throughout, with a strong keel and furrow on their proximal half, almost triangular in cross-section in this half, but oval in the distal half; their free extremity truncated, often oblique, sometimes trumpet-shaped; the walls of the zoecium irregularly annulated towards the distal end, and often constricted a short distance below the tip, the base of some zoecia irregularly inflated. The polypide with a small lophophore, which bears about thirty



FIG. 1.—Part of a colony of *P. bombayensis*,  $\times 16$ .

tentacles; base of the stomach rounded. Free statoblasts few, elongate, often irregular in outline; the swim-ring well developed and broad; the central capsule profusely and regularly tuberculate. Fixed statoblasts broadly oval, surrounded by a chitinous ring which is often produced irregularly at several or many points and is devoid of reticulate markings.

*Habitat*.—On lower surface of stones in a lake and pond at Igatpuri, Western Ghats, Bombay Presidency. November, 1907; N. Annandale *leg*. Often covering a considerable area; many of

the zoaria dead and decomposed, in some only fixed statoblasts remaining.

I am by no means sure that this form is more than a local race of Mr. C. Rousselet's *P. tanganyikæ*, of which, by the kindness of Mr. R. Kirkpatrick, I have been able to examine one of the types. I have, however, submitted a specimen of the Bombay form to Mr. Rousselet, who considers it quite distinct, suggesting that it may be related to Allman's *P. fruticosa*, on account of a similarity in the measurements of the statoblasts he himself has examined. But what I call *P. fruticosa* is a slender species with more or less free colonies, a faintly tinted cuticle, and a rounded distal extremity to the zoecia; and in my diagnosis of this form I follow Allman's figures (*Mon. Freshwater Polyzoa*, pl. vi). My new species possesses none of these characters and differs from *P. tanganyikæ* only in the following points: (1) its darker colour; (2) its strong keel, which gives its basal half almost a triangular outline in cross-section; and (3) its possession of free statoblasts. It resembles the African species in characters perhaps more important, *viz.*, in its annulate and truncated zoecia and its habit of partially embedding its colonies in the substance to which it adheres.

The truncate appearance of the zoecia is naturally most distinct when the polypides are contracted. In this condition the zoecia apparently resemble those of *P. philippinensis*, Kraepelin, between which and the African form *P. bombayensis* is evidently in some respects intermediate. When the polypides are expanded it is seen that there is a much sharper division between the zoecium proper and what Allman calls the tentacular sheath than there is in most species of the genus, in which, as a rule, the chitinated cuticle fades away gradually at the distal extremity of the zoecium, giving place to a soft membrane. In *P. bombayensis* and *P. tanganyikæ*, however, and apparently in *P. philippinensis* also, the walls of the zoecium are unusually stout and terminate abruptly, the tentacular sheath and the parts immediately adjacent to them being extremely delicate and collapsing completely when the polypide is drawn into the aperture.<sup>1</sup> In *P. emarginata*, which resembles these forms to some extent in the thickness of the walls of the zoecia, although the zoecia themselves have a much smaller diameter, the aperture is as a rule more or less lateral, not terminal, and is approached by a distinct triangular patch of rather stout but almost transparent membrane situated on the upper surface of the zoecium, the tip of which is rounded even when the polypide is fully contracted.

As I find that the statoblasts of the Indian forms of *Plumatella* do not afford, in their exact actual or proportional measurements, any safe specific criterion, I have purposely omitted to give measurements of those of *P. bombayensis*; but I may say that, in the few specimens I have examined, the breadth equals about two-thirds

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<sup>1</sup> Probably *P. aplinti*, MacGillivray, from Australia (*Trans. Roy. Soc. Victoria*, v, p. 203, 1860) also belongs to this group, but the description is very incomplete.

of the length, and that the central capsule is about three-fourths as broad as long. The statoblast has thus neither the attenuated outline of that of *P. philippinensis* nor the broadly oval form of that of the typical *P. repens*. The form might, therefore, so far as the proportions of the statoblasts are concerned, fall into either of Kraepelin's two species *P. polymorpha* and *P. princeps*, which represent respectively the group related, as regards this character, to *P. repens* and that related to *P. emarginata* in the same way.

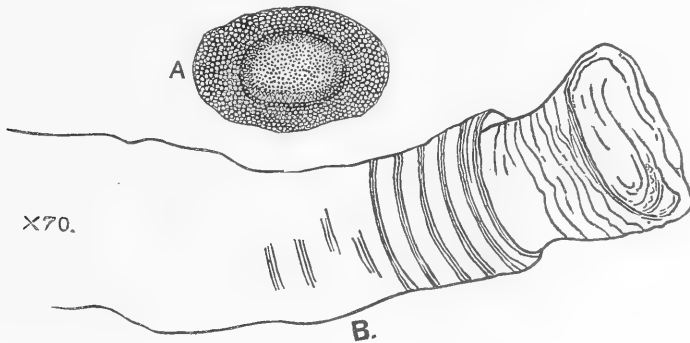


FIG. 2.—*P. bombayensis*: statoblast (A) and distal part of a zoecium (B), both  $\times 70$ .

### *Lophopus carteri* (Hyatt).

Zoaria consisting of small, mound-shaped, colourless masses of gelatinous consistency, which have the power of progression without any specialization of the base and are capable of coalescing by means of their gelatinous investment to form compound colonies of a temporary nature. Zoecia tubular, upright, rather short; their walls consisting of an inner cellular layer and an outer gelatinous one devoid of cells in the living organism. Stomach yellow, rounded, but not broadly, at the base; lophophore bearing about sixty tentacles, which are distinctly webbed at their point of origin. Statoblasts (fig. 3) large, somewhat variable in size and proportions, but averaging about 0.85 mm. by 0.56 mm., truncately oval in outline, curved longitudinally, with a wide swim-ring and an almost circular capsule, which is relatively small; the statoblast bearing at each end a series of straight processes, each of which is armed with a row of minute, blunt hooks on either side.

This form only differs from my *L. himalayanus* in the larger number of tentacles borne by its lophophore, and in the more perfect development of the processes on the statoblasts. In *L. himalayanus* these are sometimes reduced to minute rudiments (fig. 4) in statoblasts proved by their dark colour and by the fact that they are found floating free in large numbers, to be

mature. The arrangement of the zoœcia in these two forms agrees more closely with that found in *L. crystallinus* than with that found in *L. lendenfeldi*, which is further distinguished by the comparatively small size of its statoblast. By the kindness of Mr. R. Kirkpatrick

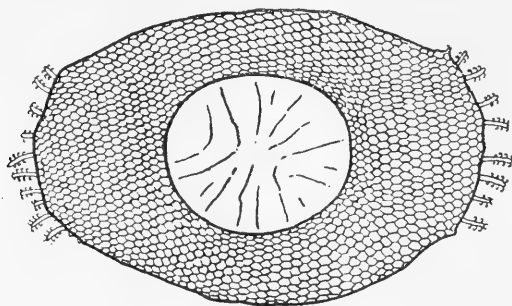


FIG. 3.—*L. carteri*: statoblast from Igatpuri Lake, W. Ghats,  $\times 70$ .

I have lately been able to examine a specimen of this Australian form, regarding which I am therefore in a position to express a more definite opinion than I was when I wrote my former note on the Himalayan form (*Rec. Ind. Mus.*, i, p. 145), in which I stated that the two were probably identical specifically. Even in *L. lendenfeldi*, judging from an examination of this specimen, cells are probably absent from the gelatinous investment in the living organism, although in specimens preserved in spirit those of the inner layer are apt to be forced out of their natural position. This is certainly the case in the two Indian forms and in *L. crystallinus*, in all of which this artificial phenomenon occurs. The cells

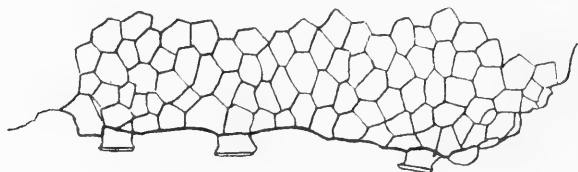


FIG. 4.—*L. himalayanus*: extremity of statoblast,  $\times 240$ .

of the inner layer, however, are distinctly larger in the Indian and Australian forms than they are in *L. crystallinus*, and are apparently more easily displaced. In *Plumatella punctata* not only have these cells all the characters of its genus, but the stiffer consistency of the cuticle, swollen though it is, prevents them from being forced into it artificially.

As regards the generic position of *L. carteri*, I have already stated (*Rec. Ind. Mus.*, i, p. 147) that I see no reason to separate it from the genus to which Carter assigned it. It must be confessed,

however, that, in order to include it, the definition of this genus must be modified, and that it is very difficult to draw an exact line between *Lophopus* and *Pectinatella*, if the younger stages of the colonies of the latter are to be taken into account, and if the Indian forms are to be placed in the former. Moreover, the Japanese forms (*Pectinatella gelatinosa* and *P. davenporti*) do not altogether agree with the only other fully described species of their genus, viz., *P. magnifica* of N. America and the continent of Europe. Unfortunately I have not yet been able to obtain a copy of the full account of *P. davenporti*, which is published by the Japanese Zoological Society, and am therefore forced to rely on the summary thereof published by Oka, the author of the species, in the *Zool. Anzeiger*, vol. xxxi, No. 23, May, 1907. Mr. Rousselet has, however, drawn my attention to the close similarity between the statoblasts of this form and those of *L. carteri*.

Further, there is a certain biological resemblance between *L. carteri* and the species of *Pectinatella*. Oka (*Journ. Coll. Sci. Tokyo*, iv, 1891) has described *P. gelatinosa* as forming gigantic compound colonies by the coalescence of numerous small zoaria, each of which arises from a single statoblast; and a somewhat similar phenomenon occurs in *P. magnifica*. I found large numbers of small zoaria of *L. carteri*, grouped together but quite distinct from one another, on the under surface of stones in the lake at Igatpuri in November last. They were apparently adult zoaria and most of them bore mature statoblasts. When they were detached from their support, however, and placed in a bottle of water, several of them coalesced so as to become, to the naked eye, a single colony, although a microscopic investigation revealed the fact that it was only the gelatinous investment that had taken part in the coalescence. Such compound colonies did not appear to be permanent, nor did I see any in natural conditions. Moreover, they showed no tendency to secrete a common basal membrane, as the components of the large colonies of *Pectinatella* do.

On the leaves of a tree whose branches dipped into the water of a lake at Kawkareik in the interior of the Amherst district of Tenasserim I found, in March last, a number of similar zoaria, quite independent of one another. They differed from those taken in the Bombay Presidency in autumn in the following characters: (1) their cœnœcium had a decided yellow tinge; (2) their polypides were larger; and (3) they bore no statoblasts. It is just possible that these were young colonies of the form described below, on the evidence of a statoblast from the same lake, as *Pectinatella burmanica*; but their zoœcia were upright and the histological similarity between them and zoaria of *L. carteri* was so close that I think they must have represented this species. If they belonged to the same species as the statoblast found in their vicinity, it would, in my opinion, be impossible any longer to separate the two genera; but this is a point on which it is not yet possible for me to express a definite opinion.

*Pectinatella burmanica*, sp. nov.

Animal unknown. Statoblast dark brown in colour, very large, almost circular, measuring  $1.56 \times 1.75$  mm., curved longitudinally; the central capsule relatively small, measuring  $0.458 \times 0.63$  mm.. Circumference armed with numerous minute hooked processes with a very short stem and often irregular or abortive in form.

*Habitat*.—Lake at Kawkareik, interior of Amherst district, Tenasserim. March, 1908; N. Annandale leg.

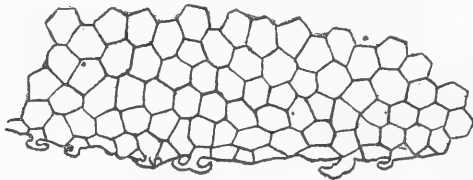


FIG. 5.—*Pect. burmanica*: part of periphery of statoblast,  $\times 240$ .

This statoblast was found attached to the protective tube of the Oligochæte worm *Aulophorus tongkinensis*, a most industrious collector of gemmules and statoblasts, whose tubes, so common in Indian ponds and lakes, generally afford some indication of the sponges and polyzoa to be found in the locality in which they are taken. Together with the specimen figured were statoblasts of a species of *Plumatella* and of two genera of sponges, all fastened to the tube of a single worm. So far as it is possible to say without examining the animal, *Pectinatella burmanica* is related to *P. gelatinosa*, Oka, from Japan, whence I have received some mounted statoblasts from Mr. C. Rousselet. The statoblasts of the latter form are, however, subrectangular in outline and their processes are more numerous and much more constant in form. As regards its shape, the statoblast of the new species somewhat resembles that of *Lophopus jheringi*, Meissner, but the latter is considerably smaller ( $0.8 \times 1.0$  mm.) and apparently lacks processes of all sorts. As regards the distorted and often degenerate nature of the hooked processes *P. burmanica* resembles *Lophopus himalayanus*, but in the latter form the processes are often more complex and, when they occur, are invariably confined to the extremities of the statoblast; the latter being a feature which may serve to distinguish *L. carteri* as well as *L. himalayanus* (if these two are specifically distinct from one another) from all species of the genus *Pectinatella*.

XXI.—ON TWO NEW SPECIES OF EAGLE-  
RAYS (*MYLIOBATIDÆ*), WITH NOTES  
ON THE SKULL OF THE GENUS  
*CERATOPTERA*.

By R. E. LLOYD, M.B., B.Sc., Capt., I.M.S., formerly Surgeon  
Naturalist, Marine Survey of India.

During a brief collecting trip to Puri, on the Orissa Coast, recently taken in conjunction with Dr. N. Annandale, we were informed that a gigantic fish had been lately caught in the seine net of some local fishermen, who regarded the capture as a most unusual event. Search was made for evidence of this story, with the result that a portion of an immense ray was found almost buried in sand close to high-water-mark.

The specimen, although in an advanced stage of decomposition, was covered with tough skin, so that the form of the head was completely preserved. From the appearance of the wide mouth, gaping directly forwards and flanked by two cephalic flippers, the fish was recognised to be one of those rays which, owing to their gigantic size, are rarely captured, and still less often appear in Museum collections. The specimen, which measured three feet nine inches across the head from eye to eye, was despatched to the Indian Museum.

Unfortunately the great pectoral fins had been cut off at the time of its capture, but the complete head and shoulder girdle with the intervening gill bars were obtained. A detached tail-like portion of vertebral column was found close by, bearing a median dorsal fin and a curious rounded knob (plate v, fig. 3). From the character of the skin this was seen to be part of the same remarkable fish. The dorsal fin in the *Myliobatidæ* is situated at the hinder end of the disc between the pelvic fins; this detached portion must therefore belong to the disc and not to the tail; furthermore, the anterior end of it fits on to the exposed centrum which terminates the vertebral column behind the shoulder girdle.

The *Myliobatidæ* are by some authors divided into two groups, —*Myliobatina* and *Ceratopterina*. It will be shown further on that this division is highly justifiable. It is difficult to imagine two structures more unlike one another than the skulls of *Ceratoptera* and *Aëtobatis*, the latter genus being taken as an example of the *Myliobatina*.

The group *Ceratopterina* contains three genera, two of which have been long known. All three are characterised by possessing

long cephalic flippers or horns one on either side of the head. They may be briefly defined thus—

- (1) *Dicerobatis* (Blainville) has an inferior mouth, teeth in both jaws, and a smooth skin.
- (2) *Ceratobatis* (Boulenger) like *Dicerobatis*, but teeth restricted to the upper jaw.
- (3) *Ceratoptera* (Müller and Henle) has an anterior mouth, teeth in the lower jaw only, and numerous denticles on the skin.

Our specimen from Puri evidently belongs to the last of these (*Ceratoptera*), although the genus has not been hitherto recorded from the Bay of Bengal,<sup>1</sup> and is known from only a very few specimens.

Two species have been recognised: *Ceratoptera vampyrus* (Duméril), found in American seas, bears 100 series of teeth on the lower jaw (this is the *Manta birostris* of American writers, the much-dreaded devil fish of the Panama pearl fisheries); the other, *C. ehrenbergii*, bears 200 series of teeth, seven in each series, and is found in the Red Sea.

In a footnote to page 498 of his *Catalogue of Fishes*, vol. viii, Günther writes: "On an unpublished<sup>2</sup> plate of the *Symbolæ Physicæ* this species" (*C. ehrenbergii*) "is named *Cephaloptera stelligera*; the horns are horizontally bent inwards." Reference to this plate shows that our specimen from Puri bears a considerable resemblance to the species from the Red Sea; even the denticles of the skin, which are clearly depicted, show a marked similarity in the two cases. In the *Symbolæ Physicæ* each denticle is shown as a stellate (usually six-rayed) base bearing a bluntly pointed tubercle which in some cases shows slight irregularity. It is possible that the horns may have been bent inwards during life but our photographs (plate iv) show what seemed to be the natural position of these appendages.

*Ceratoptera orissa*, sp. nov.

The specimen from Puri, for which the name *Ceratoptera orissa* is proposed, is differentiated from the others by the following features:—

- (1) The dentition of the lower jaw is in 370 series, each consisting of 14 teeth. In their peculiar columnar form and in the regularity of their arrangement, the teeth show a close similarity to those depicted in the *Symbolæ Physicæ*. Each tooth is separated by a well-marked interspace from its neighbours (text-fig. 1).

<sup>1</sup> Day, relying on a woodcut published by Sir Walter Elliot, has provisionally included *Ceratoptera* among the fishes of India. A comparison of this woodcut with the figure in the *Symbolæ Physicæ* and with our specimen from Puri shows, however, that this woodcut cannot be regarded as a representation of *Ceratoptera*.

<sup>2</sup> Published subsequently in *Symbolæ Physicæ*, Berlin, 1899.



- (2) Behind the dorsal fin is a remarkable globular swelling of the size of a man's fist (fig. 3, plate v). This is not present in the other species.
- (3) The denticles of the skin consist of a stellate base, usually six-rayed, which bears a multifid spine.

Other specific characters cannot be defined as the specimen was incomplete.

The diagram, plate x, fig 2, which is drawn to scale, shows the principal measurements of the head.

The upper surface of the head and adjacent portions of the disc were of a dark greenish grey colour contrasting sharply with the pure white of the oral surface.

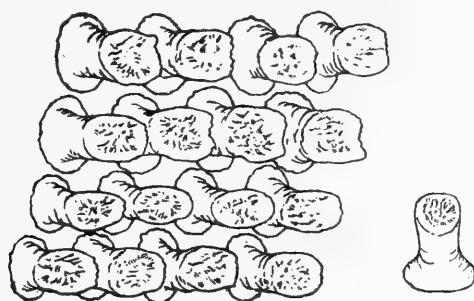


FIG. 1.—Teeth of *Ceratoptera orissa*, sp. nov.

The upper surface of the cephalic flippers and the sides of the head were white, as were the lower two-thirds of the ocular prominences.

The mouth was overhung by a thin curtain or velum of white skin; the depth of this curtain was about four inches except towards the middle where it was considerably reduced, allowing a view of the interior of the mouth.

This velum, which is analogous to an upper lip, is quite distinct from the broad nasal flap; it resembles that structure and is attached behind it. Figure 2, plate v, shows these features, as well as the band of teeth on the lower jaw. Other measurements are as follows:—

Between the nostrils	..	..	61 cms.
Width of mouth	..	..	55 „
Dimension of the band of teeth	..	..	47 by 2·5 cms.
Greatest diameter of eyeball	..	..	7 „
Corneal aperture of eye	..	..	2 „
Greatest diameter of spiracle	..	..	5 „

The cranium of *Ceratoptera orissa* consists of a single lamina of cartilage measuring 95 cms. in breadth but only 20 in length in the middle line. The outer ends of this lamina turn forwards as two spatulate projections which lie over and support the bases of the

cephalic fins. The skeleton of these fins, as in the other members of the *Myliobatidæ*, is directly continuous with the skeleton of the pectoral fins. The actual brain case is a very insignificant part of the cranium, being represented by a dome-shaped box measuring only 13 cms. in breadth, situated close to the condyles.

With the exception of the small portion which lodges the brain, this cranial lamina has a uniform thickness of half an inch in the dried state. It terminates laterally in simple margins, hence the cranium appears to be devoid of true orbits. At one point, on either side, the dry cartilage composing these margins is prolonged outwards towards the eyes as two slender shrivelled tubes which doubtless contained the optic nerves. Owing to decay it was impossible to ascertain the point at which the ocular muscles were attached to the cranium; this point would have indicated the site of the orbit.

The eyes were well preserved for, as in many other large elasmobranch fishes, the sclerotic coat was composed of thick tough cartilage; in this case the cartilage composing the back of the eyeball was more than half an inch in thickness; it was indeed so massively developed that on first examination it was thought to be the orbit itself which had been attached to the cranial margin by the slender tubular prolongation beforementioned. This misunderstanding was corrected by finding traces of the tendinous insertions of the ocular muscles attached to the outer surface of the globe.

The jaws and their suspensory apparatus were of the type common to the order. The hyomandibular is laminate in form and is firmly attached at its upper (or inner) end to the cranium close to the occipital condyle of the same side; it also receives additional support by being, as it were; wrapped round the posterior margin of the cranial plate. Its lower (or outer) end supports the jaws and hyoid. The upper and lower jaw differ remarkably in appearance.

The upper jaw is a straight slender bar, no thicker than a man's thumb, attached at either end to the hyomandibulars. The lower jaw, which has, of course, the same attachments, is a massive plank-like structure measuring 12 cms. in depth; one surface of this looks upwards and forwards and bears the curious ribbon-like band of teeth which are detachable with the skin.

The lower edge of the mandible forms a prominent ridge sharply defining the oral face from the ventral surface; in the same way the anterior margin of the cranial lamina, which forms an open curve, sharply separates the oral face from the dorsal surface.

The skeleton, which carries the great pectoral fins on either side, is prolonged forwards beneath the spatulate processes of the cranium, to render support to the cephalic fins; beneath these processes it is united to the cranium itself by a cartilaginous bar which is fixed to the cranium just outside the nasal fossa (point  $\times$ , fig. 1, pl. x).

In order that a better understanding of the cranium might be arrived at, the skull of *Aëtobatis*, a common genus belonging to the *Myliobatina*, was cleaned and examined.

This was so different from the skull of *Ceratoptera* that it has been shown in outline in fig 3, pl. x. The cranium of *Aëtobatis* is a box-like structure provided with well-developed orbits, that is to say it is not unlike the type found in many other elasmobranch fishes, but a great contrast to that of *Ceratoptera*. This difference is so marked that a separate origin for the two divisions of the *Myliobatidæ* might have to be admitted. In order to demonstrate this, an examination of the skulls of other genera of the family would be necessary.

FIG. 2.—Teeth of *D. eregoodoo*.FIG. 3.—Teeth of *D. thurstoni*.

During a recent visit to Madras I had, through the kindness of Mr. E. Thurston, an opportunity of examining the large rays in the Museum of that city. Among them are two examples of *Dicerobatis* which clearly belong to separate species. Photographs of these are shown on plate iv. One of them agrees closely with the definition of *D. eregoodoo*, the species usually found in Indian seas, though by no means commonly. Cantor<sup>1</sup> gives a full description of this fish; regarding the teeth he writes: "the teeth are uniformly minute, flattened, of a pentagonal shape, with backwards directed points; they have frequently two or three such points; they are generally twice broader than long. The upper jaw has 80, the lower jaw 94 rows of teeth." The teeth of the specimen in the Madras Museum have 60 rows of teeth in the upper jaw, but in form (text-fig. 2) they agree with Cantor's description; the teeth of the same species are shown by Duméril<sup>2</sup> in a figure which shows some slight difference. In spite of this the smaller Madras specimen should, I think, be placed in the species *D. eregoodoo*. The larger specimen is quite different, however; it has twice as many teeth, which are of a different character. As it does not appear to resemble any known species it has been described here.

*Dicerobatis thurstoni*, sp. nov.

Teeth in 140 series in the upper jaw, extending nearly to the angle of the mouth. Each tooth is separated from its neighbours by an interval, and consists of an irregular nodular base bearing from two to four spinous cusps (text-fig. 3).

<sup>1</sup> *Catalogue of Malayan Fishes*, p. 1420.

<sup>2</sup> *Hist. Nat. des Poissons*, pl. 6, figs. 2—5.

The teeth of the lower jaw could not be counted in the dry specimen as the lip was curled over; they seemed to be about as numerous as those of the upper jaw. Tail smooth, less in length than the disc, and without a spine. Proportions generally like *D. eregoodoo*, but the cephalic fins are relatively shorter than in that species; furthermore, the termination of the disc between the cephalic fins is wider, and forms a more open curve (more nearly a straight line) than in *D. eregoodoo*.

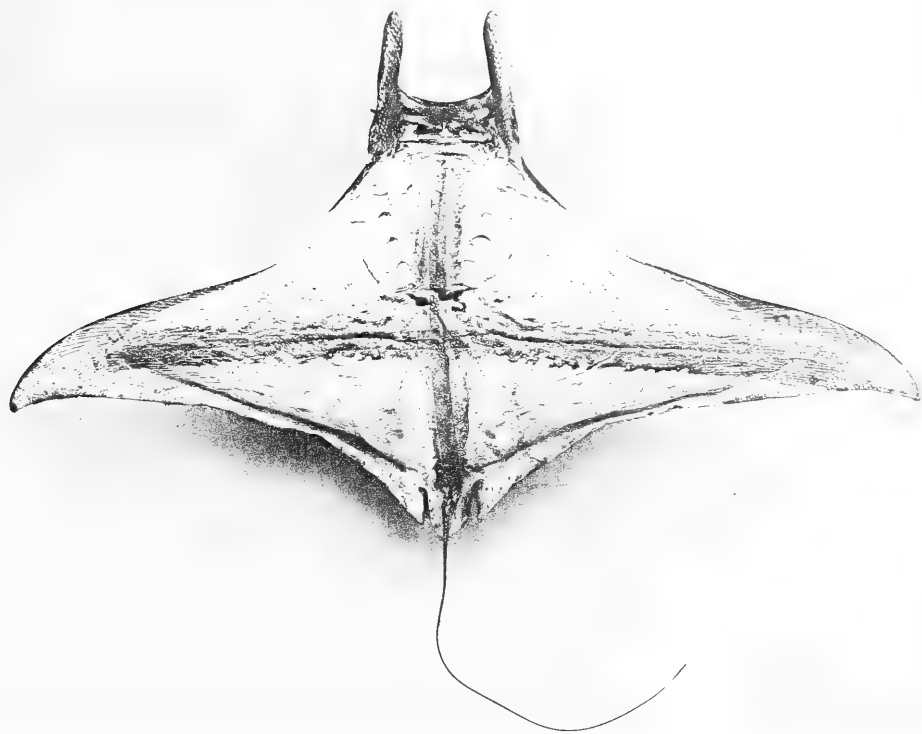
The measurements of the dry specimen are as follows:—

Greatest breadth .. ..	160 cms.
Length of disc in the middle line (excluding pelvic fins) ..	73 „
Distance between the eyes ..	27 „
Eye to tip of cephalic fin ..	13 „
Nostril to nostril .. ..	16 „
Spiracle to posterior border of the eye .. ..	4.5 „
Length of tail .. ..	53 „



EXPLANATION OF PLATE IV.

- FIG. 1.—*Dicerobatis eregoodoo*, ventral surface,  $\frac{1}{6}$  nat. size.  
,, 2.—*D. thurstoni*, dorsal surface,  $\frac{1}{11}$  nat. size.



*Fig. 1.*



*Fig. 2*



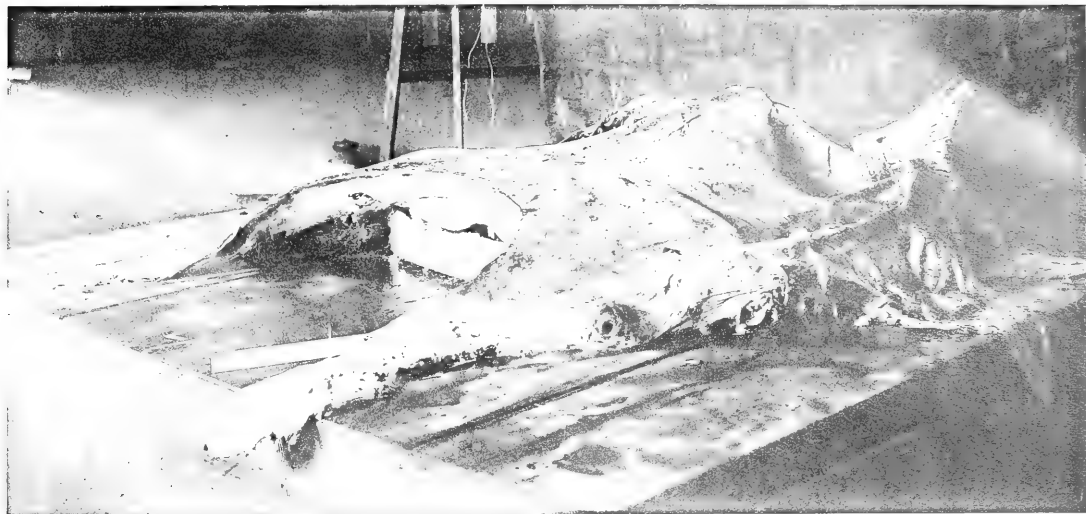




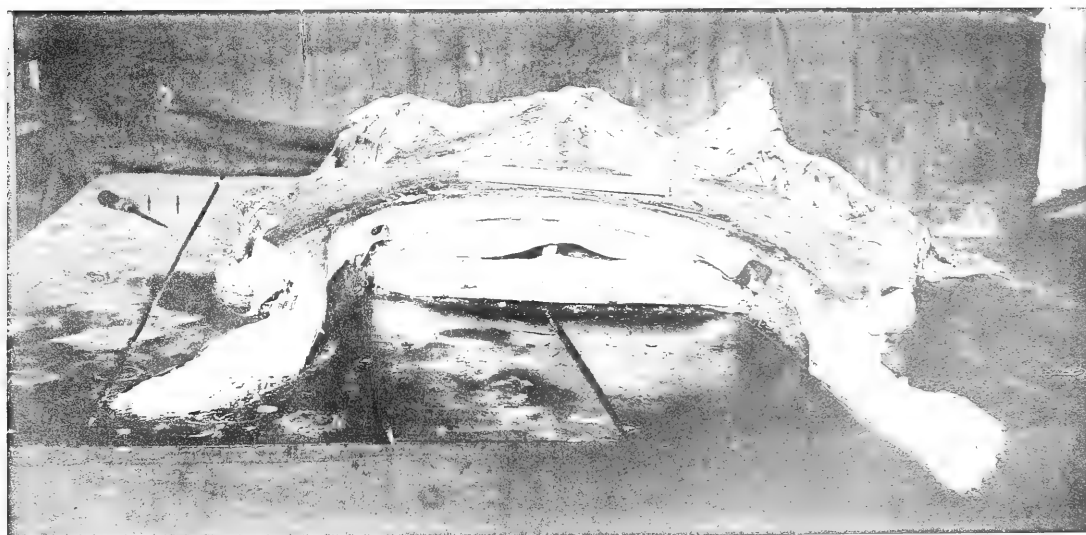
EXPLANATION OF PLATE V.

FIGS. 1 AND 2.—Side and front view of the head of *Ceratoptera orissa*,  $\frac{1}{18}$  nat. size. In fig. 2 the band of teeth can be seen close to the lower margin of the mandible; black paper has been placed in the left nostril.

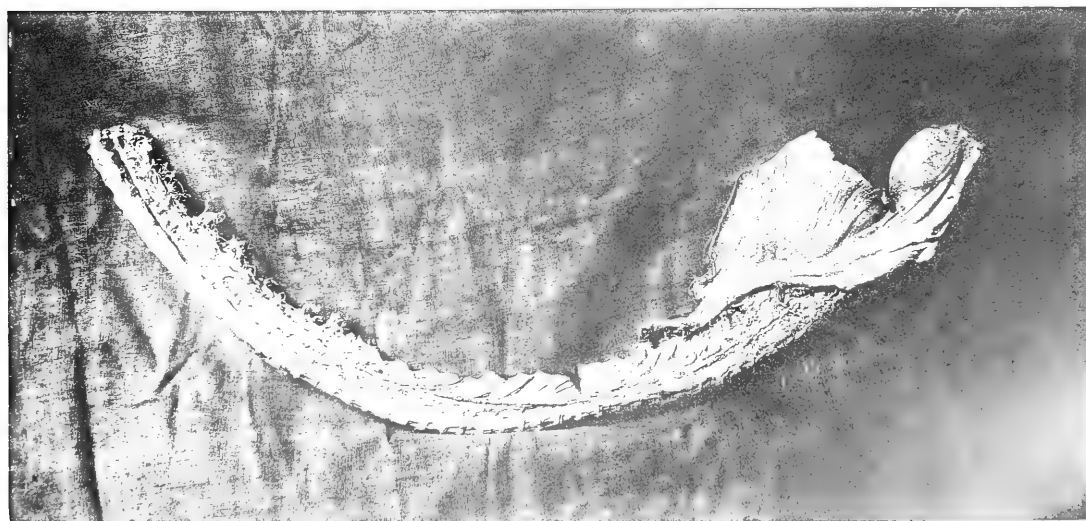
FIG. 3.—Vertebral column and dorsal fin of the same fish.



*Fig. 1.*



*Fig. 2*



*Fig. 3*





### EXPLANATION OF PLATE X.

- FIG. 1.—Diagram, to scale, of the skull of *C. orissa*: *b.c.* = brain case; *l.j.* = lower jaw; *u.j.* = upper jaw; *c.f.* = cephalic fin; *o.c.* = occipital condyle; *hm.* = hyomandibular; *n.c.* = nasal capsule; *e.* = sclerotic cartilage; *o.p.* = prolongation of the cartilage towards the eye (sheath for optic nerve); *sc.* = scapula; *co.* = coracoid; *j.* = junction of hyomandibular with the cranium: the branchial arches have been omitted; the cranium proper is shown in thick outline: *a* and *b* = denticles of the skin from above and from the side.
- „ 2.—Diagram, to scale, of the head of *C. orissa*; figures represent centimetres.
- „ 3.—Cranium of *Aëtobatis narinaria* showing well-defined orbits: *o.* = orbit; *e.* = eye; *c.f.* = cephalic fin.

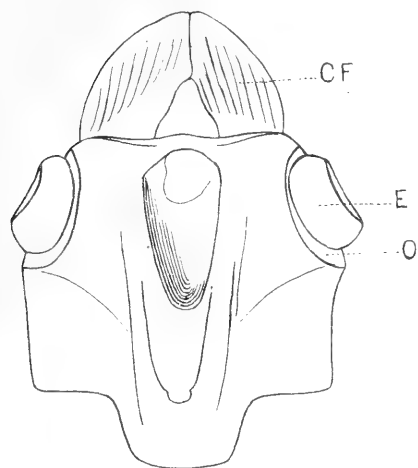


Fig. 3

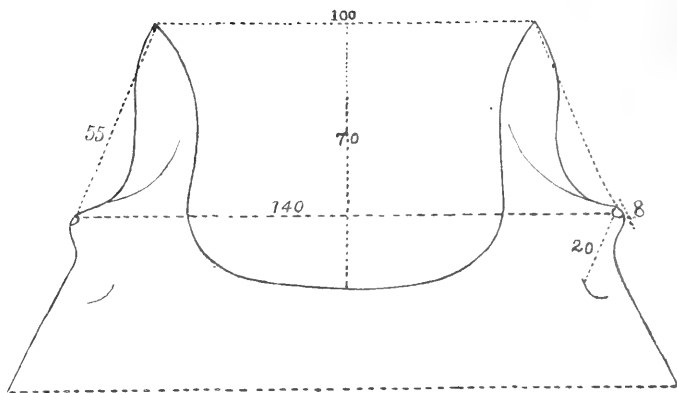


Fig. 2

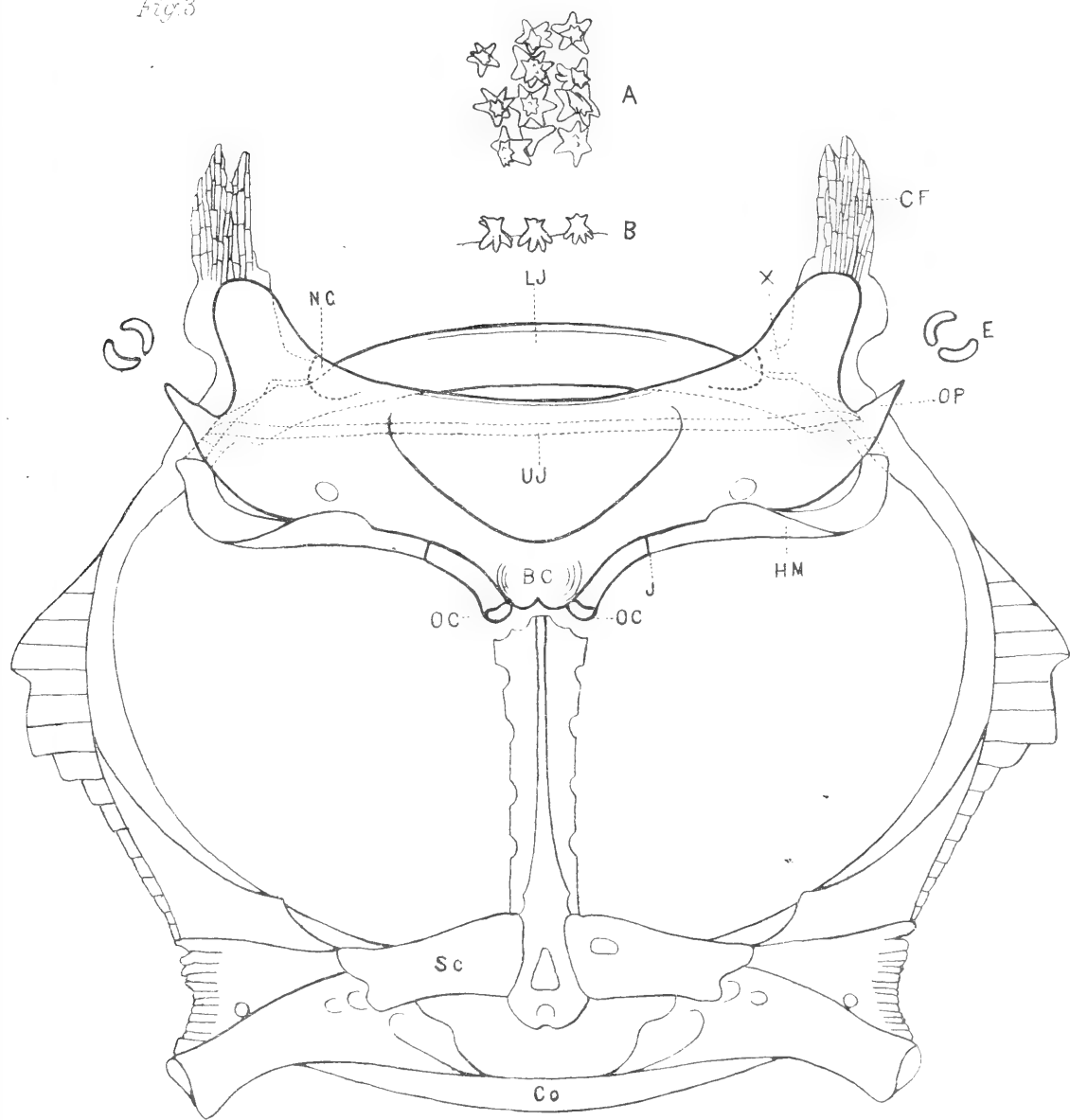


Fig. 1.





XXII.—DESCRIPTION OF A NEW SPECIES  
OF THE GENUS *SESARMA*, SAY, FROM  
THE ANDAMAN ISLANDS.

By DR. J. G. DE MAN.

A collection received from Dr. Annandale of the Indian Museum, Calcutta, comprises a new species of the genus *Sesarma*, Say. It is represented by one male and two females that were collected at Mount Hamet, Port Blair, Andaman Island, in fresh-water streams in dense forest at a height of 700 feet, by Mr. B. B. Osmaston, in January, 1907. The larger of the two females, which are a little smaller than the male, carries a *Sacculina*.

*Sesarma thelxinoë*, sp. nov.

(Plate xi.)

A new species of the subgenus *Sesarma*, related to *Sesarma sylvicola*, de M., from Sumatra, to *S. ocypoda*, Nob., from Benkoelen and to *S. celebensis*, Schenkel, from Celebes.

Both in the male and in the female the distance between the outer orbital angles appears a little larger than the length of the carapace, the proportion being nearly as 13 : 12. Upper surface depressed, very slightly arcuate transversely at the level of the mesogastric area, whereas the gastric region slightly slopes down forward towards the frontal lobes; posteriorly the upper surface is more flattened, whereas the epibranchial regions are deflexed downward. Regions indicated, but incompletely defined. Of the cervical groove the transverse furrow that defines the gastric region posteriorly is well developed and rather deep only in its lateral parts; the mesogastric furrow is shallow, though reaching to just behind the middle of the gastric region. The protogastric areas that slope down laterally to the lower situated, hepatic region, are not separated at all from the anterior branchial areas, nor from the mesogastric area which is also undivided. The intestinal region is bounded laterally by shallow depressions.

The front, which is vertically deflexed, is just half as broad as the distance between the outer orbital angles. Of the four post-frontal lobes, which are separated from each other by narrow, moderately deep incisions, the inner are just *twice as broad* as the outer; the post-frontal lobes are prominent and hide the front, though the lower margin is visible when the carapace is looked at from above. The free edge of the post-frontal lobes is rather sharp, though very

finely granulated; that of the inner lobes is straight and transverse in the male and in the younger female (fig. 2), but in the other female the free edge of these lobes is slightly concave and runs a little obliquely (fig. 4). The outer post-frontal lobes reach a little further forward than the inner. The front (fig. 3), which is somewhat concave, is four times as broad as high; in the male, in which the upper margin is 6.8 mm. broad, the front is 1.7 mm. high at either side of the middle. The lateral margins of the front are nearly parallel, being only very slightly convergent; the lower margin is but very faintly sinuous, the median emargination is broad, but *very shallow*, and the lateral ones are hardly recognisable. Viewed from before, the lower margin appears straight in the middle; on each side of the middle it appears, in the male, very slightly concave, but in the two females distinctly so. The front is covered, especially laterally, with microscopical granules, but the anterior surface of the inner post-frontal lobes is almost smooth; lying on each side contiguous to the lower margin are two or three somewhat larger granules.

As in other species, a transverse ridge is situated a little behind the free margin of the outer post-frontal lobes; between this margin and the ridge, which is very finely granulate and presents a somewhat oblique direction, the upper surface of the outer frontal lobes is covered with some small granules, that anteriorly are partly arranged in transverse rows. Some small granules are also observed on the anterior half of the hepatic region and near the antero-lateral margins of the carapace, as also two short, finely granulated ridges, the anterior, shorter one on the extraorbital tooth, the other near the middle of the first epibranchial tooth. The deflexed, branchial regions are marked with the usual oblique striae. All the rest of the upper surface of the carapace is *perfectly smooth, without any trace of granules*, even when examined through a magnifying glass; *the inner post-frontal lobes are thus also quite smooth above as far as their anterior margin*. The upper surface is, however, punctate, finely on the gastric region, more coarsely on the branchial regions and on the depressions that separate the latter from the area intestinalis; in a few puncta short, stiff setae are inserted. As in *S. sylvicola*, the lateral margins of the carapace distinctly diverge backward and are very faintly concave behind the middle.

Extraorbital tooth acute, its outer margin slightly convex, sometimes straight or even faintly concave; by a rather deep, triangular notch this tooth is separated from the first epibranchial, which is also acute and, like the extraorbital tooth, somewhat turned upward; the outer margin of this tooth, which is once-and-a-half as long as the extraorbital tooth, is straight and already divergent. A trace of a very small second epibranchial tooth is indicated. The posterior margin of the carapace is just as broad as the front.

The abdomen of the male (fig. 5) resembles that of *S. sylvicola* (de Man, *Abhandl. Senckenberg. Naturf. Gesellschaft*, xxv, 1902,

pl. xix, fig. 11*b*); the obtuse, terminal joint is almost once-and-a-half as long as the penultimate, and the posterior margin of the latter is two-and-a-half times as broad as this joint is long. In the younger female the terminal segment is for one-third of its length impacted in the penultimate, in the other female not even as far.

Chelipedes equal, both in the male and in the female. Outer surface of the arm transversely wrinkled, neither the upper nor the inner border of the arm ends in a tooth or spine; but the inner border presents a slight, subterminal dilatation and appears finely, though irregularly, denticulate along its whole length; about thirty very small acute teeth, recognisable through a lens, occur on the lower border. Upper surface of the wrist covered, especially on its outer side, with finely crenulate ridges, inner angle obtuse—not dentiform; examined by means of a lens a few minute setæ are observed on the upper surface. In the male the horizontal length of the chelæ (fig. 6) measures three-fourths the distance between the outer orbital angles; the fingers are a little longer than the palm which is one-fourth higher than long. To the naked eye both palm and fingers appear smooth. Examined by means of a magnifying-glass the rounded upper border of the palm, which carries no pectinated crests, appears a little granular by very small granules; but for a few oblique striations near the carpal articulation, the convex outer surface of the palm appears *perfectly smooth*; the rounded lower margin is slightly granular, the granules being microscopical, though slightly larger and rather acute on the inner side and extending here to the middle of the immobile finger. The fingers are pointed; their convex, outer surface is smooth, though somewhat punctate; the tapering dactylus has neither ridges nor grooves, but is covered above *with minute subacute granules* that extend to near the tip and are rather *irregularly arranged*. The inner surface of the palm presents no trace of a transverse crest or ridge, but it carries a few, very small, subacute granules, visible by a lens, one or two of which near the upper border are a little larger than the rest. The immobile finger has two small, conical teeth, one contiguous to the horny tip, the other near the base, and between them are six or seven smaller teeth, while two or three occur near the base; the toothing of the dactylus is nearly the same.

The chelæ of the female are comparatively smaller, measuring three-fifths only of the distance between the outer orbital angles; but the fingers are comparatively longer than in the male. The oblique striæ near the carpal articulation are hardly developed and the upper border of the dactylus is nearly smooth; the granules on the inner surface of the palm are also fewer in number and smaller.

The ambulatory legs apparently closely resemble those of *S. sylvicola*. The meropodites, which have a subterminal, acute tooth on the anterior border, are slender like the other joints, and their outer surface is covered with short, transverse, crenulate lines,—that of the last pair excepted, these being nearly smooth; so,

*e.g.*, are the meropodites of the penultimate pair three times as long as broad. The carpal joints, which, like the following joints, are smooth, are furnished on their outer surface with two longitudinal ridges, less distinct on those of the last pair. The propodites are little more than three times as long as broad, and the dactyli are but little shorter than the penultimate joints; in the male, not in the female, the posterior margin of the dactyli is tomentose, as also the distal third part of that of the propodites. The ambulatory legs are fringed with stiff bristles which are black on their proximal and white on their distal half.

The carapace and ambulatory legs are red-brown, the chelipedes yellow.

<i>Measurements in millimetres.</i>		♂	♀	♀
Distance between the outer orbital angles		13.7	12.75	12.4
Length of carapace, measured in the middle line, abdomen excluded	..	12.75	11.6	11.5
Breadth of the upper margin of the front		6.8	6.5	6.4
Distance between the 1st epibranchial teeth	..	..	13	12.75
Greatest width of the carapace	..	14.4	13.75	13.5
Breadth of posterior margin of carapace	..	7	6.5	6.6
Length of the terminal joint of abdomen	..	2.5	..	..
„ „ „ penultimate joint	..	1.8	..	..
Breadth of the anterior margin of this joint		2.7	..	..
„ „ „ posterior „ „ „ „		4.6	..	..
Length of antepenultimate joint	..	1.52	..	..
Horizontal length of chela	..	10.4	7.75	8
„ „ „ fingers	..	5.7	4	4.3
Height of the palm	..	5.5	3.8	4
Length of meropodite	} of penultimate pair of legs {	10.4	9	8.5
Breadth		3.2	3	3
Length of propodite in the middle		7	6	6
Breadth of „ „		1.8	1.9	1.7
Length of dactylus		6.5	5.75	5.75

*Sesarma thelxinoë* differs at first sight from *S. ocypoda*, Nob., its variety *gracillima*, de M., and *S. sylvicola*, de M., by the smoothness of the gastric region and of the upper surface of the inner post-frontal lobes, as also by the smoothness of the outer surface of the chelæ. There are, however, still more differences, for which I refer to my work in *Abhandl. Senckenb. Naturf. Gesellschaft*, xxv, 1902, pp. 522-527, pl. xix, figs. 9-11.

Of *S. aranea*, Nob., a young male specimen, from the Island of Nias, kindly presented to me by Dr. Nobili, is lying before me. The distance between the outer orbital angles is 6.3 mm., the length of carapace 6 mm., and the lateral margins slightly diverge posteriorly, so that, as regards the general shape of the carapace, both species agree with one another. The first epibranchial tooth is, however, shorter than the extraorbital tooth and less prominent laterally; the upper surface of the inner post-frontal lobes and

the anterior part of the protogastric areas are *distinctly rugose and granular*; the front is *higher*,—3 mm. broad, 1 mm. high; the chelæ are *granular* on their outer surface and the five or six acute teeth on the proximal half of the upper margin of the dactylus are *much larger* than in *S. thelxinoë*. The abdomen has a different shape, resembling that of *S. moeschii* (de Man in Max Weber's *Zoolog. Ergebn.*, 1892, tab. xx, fig. 14a); the penultimate segment, indeed, is *much less enlarged*, its posterior margin is 1.92 mm. broad, while this segment is 0.9 mm. and the antepenultimate 0.72 mm. long. Both species are therefore considered as different, but an examination of younger individuals of *S. thelxinoë* will be useful in order to see whether they show the same characters as the adult.

*Sesarma* (*Sesarma*) *amphinome*, de M., of which a female from Sintang, described in 1899, is lying before me, is a more different species.

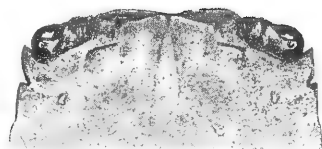
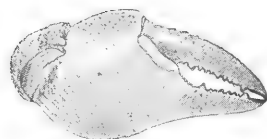
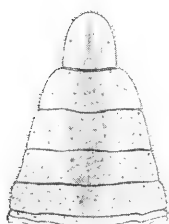
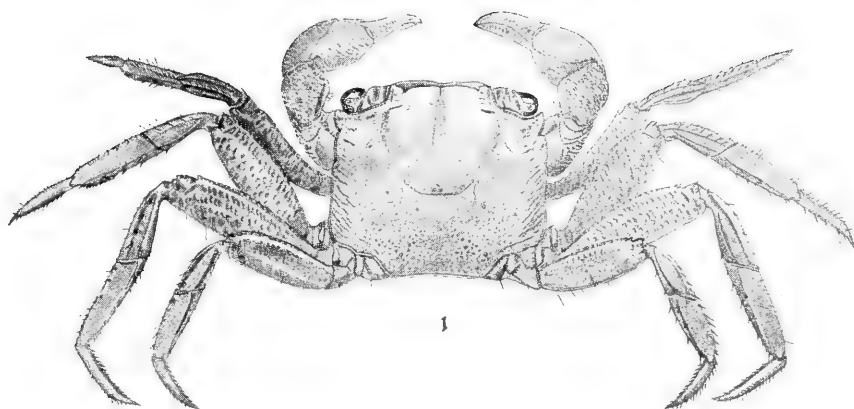




EXPLANATION OF PLATE XI.

- FIG. 1.—*Sesarma thelxinoë*, sp. nov., male,  $\times 2$ .  
,, 2.—Front of the same specimen viewed from above,  $\times 3$ .  
,, 3.— „ „ „ „ „ „ before,  $\times 3$ .  
,, 4.—Anterior half of the upper surface of the larger female,  $\times 3$ .  
,, 5.—Abdomen of the male,  $\times 3$ .  
,, 6.—Chela of the male,  $\times 3$ .





J.G. de Man. del., Dec. 1907.

*SESARMA (SESARMA) THELXINOE*, DE MAN.



# XXIII.—DESCRIPTIONS OF NEW SPECIES OF LAND, MARINE AND FRESHWATER SHELLS FROM THE ANDAMAN ISLANDS.

By H. B. PRESTON, F.Z.S.

The species described in the present paper formed part of the collection of the late Rev. J. Warneford who was, for many years, Chaplain to His Majesty's Forces in the Andaman Islands, and an ardent and indefatigable collector; the collection took twelve years to amass, and is perhaps the largest ever got together on those Islands. The "types" have recently been acquired by the Trustees of the Indian Museum, in whose collection they now are.

## *Sitala denselirata*, sp. nov.

Shell perforate, conical, carinate at the periphery, opaque, pale yellowish horn colour; whorls  $6\frac{1}{2}$ , rather convex, sculptured with fine spiral liræ; base of shell somewhat convex, spirally striate; columella straight, reflexed over the very narrow umbilicus, peristome acute; aperture sub-quadrate.

Altitude	..	..	6	mm.
Diam., major	..	..	6.25	,,
Aperture, alt.	..	..	2.25	,,
,, diam.	..	..	3	,,
Habitat—Andaman Islands.				

Approaching *S. attega*, Benson<sup>1</sup> (= *cadelli*, Nev. MS.). The spire is, however, less acuminate and in general shape the shell is much narrower in proportion to its height; the carination is also not so marked and the spiral sculpture is coarser than in *S. attega*.

## *Tornatina conspiciua*, sp. nov.

Shell imperforate, regularly cylindrical, white, shining, covered with a rich reddish brown periostracum; spire somewhat exerted; whorls 6, the last sculptured with fine, wavy spiral striæ; sutures deeply and broadly channelled; aperture narrow, scarcely dilated below, a thickening of the shell appearing about half a millimetre from the edge of the peristome; peristome slightly inflated in the middle, acute; columella arched, terminating in a basal fold, a callus extending from it to the suture.

<sup>1</sup> *Ann. Mag. Nat. Hist.* (3), iii, p. 184, 1859.

Altitude	..	..	10.5 mm.
Diam., major	..	..	4.5 „
Aperture, alt.	..	..	9 „
„ diam., minor	..	..	.75 „
Habitat—Off Port Blair, Andaman Islands, 7—10 fathoms.			

*Atys convexa*, sp. nov.

Shell umbilicate, tumid, ovate, constricted at the ends, pale lemon colour, with two irregular narrow greenish bands especially noticeable on the ventral surface, smooth, polished except at the ends where it is spirally grooved; apex closed; aperture narrow above, broadening below; columella descending obliquely, curved outwards, produced; peristome simple, rising high above the vertex.

Altitude	..	..	3.25 mm.
Diam.	..	..	2 „
Habitat—Off Port Blair, Andaman Islands, 7—10 fathoms.			

*Atys neglecta*, sp. nov.

Shell imperforate, elongately ovate, sub-cylindrical, rather convex in the middle, greyish white, polished, smooth except at the ends where several grooves appear; apex closed; aperture very narrow above, moderately wide below; columella oblique; peristome broadly thickened, bent slightly inwards, a little extended above the vertex.

Altitude	..	..	4 mm.
Diam., major	..	..	2 „
Habitat—Off Port Blair, Andaman Islands, 7—10 fathoms.			

*Atys pacei*, sp. nov.

Shell straight, cylindrical, semi-transparent white, sculptured throughout with fine spiral striæ, becoming more numerous and closely set towards the base; apex very narrowly perforate; aperture narrow above, dilated below; columella obliquely arched; peristome simple, rising above the vertex.

Altitude	..	..	11 mm.
Diam., major	..	..	5 „
Habitat—Off Port Blair, Andaman Islands, 7—10 fathoms.			

*Atys vixumbilicata*, sp. nov.

Shell ovate, narrowly perforate, pale yellowish horn colour, very finely spirally striate and rather coarsely grooved towards the ends; apex closed; aperture narrow above, broadening below;

columella descending obliquely ; peristome thickened, produced above the vertex.

Altitude	..	..	3.5 mm.
Diam.	..	..	2 „
Habitat—Off Port Blair, Andaman Islands, 7—10 fathoms.			

*Haminea callosa*, sp. nov.

Shell ovate oblong, very narrowly perforate, yellowish horn colour, thin, vitreous, marked with oblique transverse lines of growth ; peristome simple ; aperture narrow, posteriorly elevated, not greatly expanded anteriorly ; columella twisted at base, a callus joining it with the lip above.

Altitude	..	..	15 mm.
Diam., major	..	..	9.25 „
Aperture : diam., min.	..	..	1 „
Habitat—Off Port Blair, Andaman Islands, 7—10 fathoms.			

*Terebra carnicolor*, sp. nov.

Shell subulate, pale flesh colour, polished, shining ; remaining whorls 15, sculptured with closely set longitudinal costæ, crossed near the upper end by a slight spiral groove, thus forming an infra-sutural crenate band ; the interstices between the costæ spirally punctate, the punctations of the upper row being coarser than the rest ; aperture small, narrow ; columella descending rather obliquely ; peristome simple ; base of shell marked with three revolving punctate grooves.

Altitude	..	..	22 mm.
Diam., major	..	..	4 „
Aperture, alt.	..	..	3 „
„ diam.	..	..	1.25 „
Habitat—Andaman Islands.			

*Terebra rubrobrunnea*, sp. nov.

Shell narrowly subulate, reddish brown ; remaining whorls 21, very flat, sculptured with oblique, rather closely set transverse costæ interrupted by spiral striæ and two crenate sutural bands, the upper of which is much the broader ; sutures scarcely impressed ; columella descending in a curve, extending into a thick, projecting callus which joins the lip above ; peristome sinuous, slightly reflexed ; aperture narrowly ovate ; canal short, re-curved.

Altitude	..	..	47 mm.
Diam., major	..	..	6 „
Aperture, alt.	..	..	6 „
„ diam...	..	..	2 „
Habitat—Andaman Islands.			

Allied to *T. fenestrata*, Hinds<sup>1</sup>; the transverse costæ in the present species are, however, closer together and not so coarse, the spiral striæ are also more numerous and not so well defined.

*Terebra unicolor*, sp. nov.

Shell rather bluntly, elongately subulate, pale brownish orange throughout; remaining whorls 17, sculptured with a coarse infrasutural spiral crenate rib and five smaller spiral crenate ribs, the interstices finely punctate; aperture small; columella recurved, twisted; canal short.

Altitude	..	..	44 mm.
Diam., major	..	..	7.25 „
Aperture, alt.	..	..	6 „
„ diam.	..	..	2.5 „
Habitat—Andaman Islands.			

Allied to *T. albomarginata*, Desh., of which species I was at first inclined to consider it a variety, but its much blunter form, lack of white edging to the whorls, coarser ribbing and finer punctuation lead me to think that it is specifically distinct.

*Conus edwardi*, sp. nov.

Shell turbate, coronate, white, the upper whorls tessellated with reddish brown; the body whorl painted with four irregular bands of bright reddish brown, the first much interrupted, the intervening spaces streaked, tessellated and very indistinctly lined with the same colour, faintly and regularly spirally striate; spire bluntly exserted; interior of shell whitish, except at the base where the reddish brown colouring is again apparent.

Altitude	..	..	58 mm.
Diam., major	..	..	28 „
Aperture, alt.	..	..	49.5 „
„ diam., minor	..	..	3 „
Habitat—Andaman Islands.			

Allied to *Conus zonatus*, Hwass; it is, however, narrower and less pyriform in shape, the spire is more exserted and the beautiful reddish brown colouring readily distinguishes it from that well-known species, in which the bands are purplish gray, and which is so conspicuously lined with orange.

*Pleurotoma rimata*, sp. nov.

Shell turreted, yellowish brown; whorls 11, the upper bearing two spiral ridges between which is a row of coarse tubercles, the intervening spaces sculptured with minute spiral and transverse striæ, the last whorl bearing five spiral liræ in addition to the

<sup>1</sup> *Proc. Zool. Soc. London*, 1843, p. 153.

row of tubercles between the first two of these ; base of shell coarsely spirally lirate ; aperture oval ; peristome reflexed, especially round the sinus ; sinus broad and rather deep ; columella lip expanded, erect, forming an umbilical fissure between it and the base of the shell ; canal rather long, slightly reflexed upwards at base.

Altitude	..	..	25.5 mm.
Diam., major	..	..	10 „
Aperture, alt.	..	..	5.5 „
„ diam.	..	..	3 „
Habitat—Andaman Islands.			

Allied to *Pleurotoma acutigemmata*, Smith, which has also been recorded from the Andamans<sup>1</sup> ; it is, however, broader at the periphery, more sharply turreted, and possesses a much longer canal ; the reflexed peristome in the region of the sinus and the expansion of the columella also easily distinguish it from that species.

*Drillia fraga*, sp. nov.

Shell elongately fusiform, deep reddish brown ; remaining whorls 7, rather flat, sculptured with regular closely set rows of small white tubercles and bearing a single infra-sutural row of coarser tubercles between which and the remaining smaller rows there is a broad but shallow groove ; sutures impressed ; aperture obliquely ovate ; canal short.

Altitude	..	..	22 mm.
Diam., major	..	..	8 „
Habitat—Andaman Islands.			

In many respects resembling *Drillia digitalis*, Reeve, from the Philippines ; it is, however, separable from that species by its more acutely fusiform shape and flatter whorls ; the rows of tubercles are also placed further apart and at more regular intervals.

*Drillia sikesi*, sp. nov.

Shell solid, imperforate, acuminate fusiform, chalky white, painted with a broad, pale brown, infra-peripheral band ; whorls 10, the upper much eroded, the lower bearing a row of coarse tubercles at the periphery ; columella descending abruptly, solid, white ; sinus broad ; peristome thin and irregularly serrated ; aperture oval ; interior of shell white.

Altitude	..	..	31 mm.
Diam., major	..	..	14 „
Aperture, alt.	..	..	12 „
„ diam.	..	..	4 „
Habitat—Andaman Islands.			

<sup>1</sup> Melvill and Sykes, *Proc. Malac. Soc. London*, vol. ii, p. 165.

Closely allied to *D. exasperata*, Reeve of which species the locality is unknown; it is, however, larger and more graceful in form, the aperture is narrower in proportion to the general size of the shell, and it does not show the transverse, infra-peripheral ribbing on the last whorl which is very conspicuous in the type of *D. exasperata*.

*Mangilia andamanensis*, sp. nov.

Shell slenderly fusiform, pale yellowish brown, blotched here and there with light chestnut; whorls 7, convex, angled above, the first two horny, the later whorls sculptured with transverse ridges and fine spiral striæ, presenting a finely cancellate appearance; sutures deeply impressed; aperture oval; outer lip varicosely thickened; sinus broad but not deep.

Altitude	..	..	6	mm.
Diam., major	..	..	2	„
Aperture, alt.	..	..	2	„
„ diam.	..	..	75	„
Habitat—Andaman Islands.				

*Mangilia exasperata*, sp. nov.

Shell fusiform, pale brown, narrowly banded with a deeper shade of the same colour; whorls 9, angular, convex, the first two smooth, horny, polished, the remaining seven sculptured with coarse, transverse, varicose ridges, crossed by spiral liræ between which appear numerous fine striæ; sutures impressed; aperture elongate; outer lip varicosely thickened.

Altitude	..	..	16.25	mm.
Diam., major.	..	..	5.5	„
Habitat—Andaman Islands.				

*Mangilia obtusa*, sp. nov.

Shell obtusely fusiform, pale yellowish white, painted on the upper whorls with two thin bands of rich brown, which increase on the last whorl to two sets of stripes of the same colour, the upper set consisting of four stripes, the lower of seven; remaining whorls  $5\frac{1}{2}$ , rather flat, closely cancellate; aperture ovate; peristome varicosely thickened; sinus broad and shallow.

Altitude	..	..	6.5	mm.
Diam., major	..	..	2.25	„
Aperture, alt.	..	..	2.5	„
„ diam.	..	..	75	„
Habitat—Andaman Islands.				

*Clathurella malleti*, Récl., var. *nivca*, var. nov.

Agrees in shape and sculpture with the typical form, the opaque white median band being still somewhat prominently visible



on the body-whorl; the remainder of the shell is, however, semi-transparent white throughout.

Habitat—Andaman Islands.

The typical form also occurs in the present collection, and it appears to have been also noticed by Nevill from these Islands.

*Clathurella selli*, sp. nov.

Shell fusiform, greyish white with a continuous dark, blackish brown band at the base of the body-whorl and a much broken infra-sutural band of the same colour; whorls 7, transversely, varicosely costate and spirally ridged, presenting a coarsely cancellate appearance, the basal, spiral ridge being especially developed; sutures impressed; aperture narrow; columella descending somewhat obliquely; peristome varicosely thickened.

Altitude	..	..	4.5 mm.
Diam., major	..	..	1.75 "
Aperture, alt.	..	..	1 "
„ diam.	..	..	.5 "
Habitat—Andaman Islands, 7—10 fathoms.			

*Mitra emiliae*, sp. nov.

Shell elongately fusiform, pale reddish brown, painted with an indistinct cream-coloured infra-sutural band; whorls 9, the first six spirally grooved, the remaining three faintly striate; sutures well impressed; aperture elongately oval; peristome continuous and slightly reflexed; columella four-plaited, the two first plaits very strong.

Altitude	..	..	19 mm.
Diam., major	..	..	6 "
Aperture, alt.	..	..	8.5 "
„ diam.	..	..	1.75 "
Habitat—Andaman Islands.			

This species in some respects recalls *M. ebenus* from the Mediterranean; it is, however, paler in colour; the body-whorl is broader in proportion to the size of the shell, the peristome is continuous and the apical whorls are spirally grooved and not transversely striated and punctured as is the case with *M. ebenus*.

*Mitra warnefordiana*, sp. nov.

Shell ovately oblong, spire rather blunt, dark brown, painted with a thin, yellowish line just above the sutures and on the body-whorl at about one-fourth its height from the suture; remaining whorls 7, somewhat shouldered, spirally striate and transversely ribbed above, giving the shell a cancellate appearance, the ribs becoming obsolete on the lower portion of the body-whorl. Sutures impressed; aperture elongate; peristome slightly thickened, but

not reflexed; columella bearing three plaits, the first strong and nacreous white.

Altitude	..	..	25 mm.
Diam., major	..	..	9 „
Aperture, alt.	..	..	13 „
„ diam.	..	..	2.5 „
Habitat—Andaman Islands.			

Related to *M. cruentata*, Reeve, but is more cylindrical in general outline, is much more finely sculptured and lacks the yellow markings on the ribs; the aperture is also more elongate than in that species.

*Nassa gerstenbrandti*, sp. nov.

Shell ovately fusiform, yellowish white, narrowly banded at the sutures; periphery and base with reddish chestnut; whorls  $6\frac{1}{2}$ ; the apical whorl smooth, polished, the remainder finely, spirally striate and sculptured with somewhat distant, varicose ribs; sutures impressed; aperture inversely auriform; columella descending obliquely, extending into a callus which reaches the lip above; peristome varicosely thickened, finely denticulate within; canal short.

Altitude	..	..	4.75 mm.
Diam., major	..	..	2.25 „
Aperture, alt.	..	..	1.5 „
„ diam.	..	..	.75 „
Habitat—Andaman Islands, 7—10 fathoms.			

*Nassa jucunda*, sp. nov.

Shell fusiform, pale yellow, painted with an infra-sutural band of rich chestnut and a paler peripheral band of reddish brown; whorls 5, rather flat, sculptured with closely set transverse costæ and fine spiral striæ; sutures impressed; columella tridenticulate; aperture oval; peristome thickened, denticulate within.

Altitude	..	..	5 mm.
Diam., major	..	..	2.25 „
Aperture, alt.	..	..	1.5 „
„ diam.	..	..	.5 „
Habitat—Andaman Islands, 7—10 fathoms.			

Easily distinguished from *N. gerstenbrandti* by the finer sculpture, flatter whorls and more pronounced colouring.

*Nassa tristis*, sp. nov.

Shell fusiform, dull greyish olive with a pale infra-sutural band; whorls 8, transversely, coarsely ribbed and finely, spirally lirate; sutures impressed; peristome varicosely thickened, bearing a row of denticles just within the aperture of which the posterior one is the coarsest; aperture ovate; columella broadening into a

thick callus which reaches the lip above and bearing a bifurcated fold or plait below and an obliquely transverse plait above.

Altitude	..	..	10	mm.
Diam., major	..	..	4.25	„
Aperture, alt.	..	..	3	„
„ diam.	..	..	1.75	„
Habitat—Andaman Islands.				

*Columbella suavis*, sp. nov.

Shell elongately fusiform, polished, white, broadly banded with brownish yellow and painted with occasional blotches of a deeper colour; whorls  $9\frac{1}{2}$ , scarcely convex, sculptured with closely set, transverse ribs and very fine wavy spiral striæ; base of shell spirally sulcate; columella stained with pale violet, slightly reflexed, descending somewhat obliquely; peristome broadly, varicosely thickened, dentate within; aperture elongate; canal long, narrow, scarcely recurved.

Altitude	..	..	9.75	mm.
Diam., major	..	..	5.5	„
Aperture, alt.	..	..	4	„
„ diam.	..	..	1.50	„
Habitat—Andaman Islands.				

*Gyrineum wilmeriana*, sp. nov.

Shell acuminate ovate, yellowish white, bearing traces of having been covered with a thin hirsute periostracum; whorls 8, transversely striate and spirally lirate, bearing at intervals interrupted tubercular ribs of a dark chestnut colour; varices interruptedly painted with dark chestnut; columella extending into a rough callus which joins the lip above; peristome varicosely thickened, bearing a row of denticles within; aperture roundly ovate; canal short, recurved; operculum horny, multi-spiral, roughly laminiferous.

Altitude	..	..	28.5	mm.
Diam., major	..	..	20.5	„
Aperture, alt.	..	..	8	„
„ diam.	..	..	5	„
Habitat—Andaman Islands.				

I have much pleasure in dedicating this species to Colonel L. W. Wilmer, to whose many years' collecting in the Andaman Islands a number of interesting forms are attributable.

*Vertagus kochi*, Phil., var. *polita*, var. nov.

Much shorter, thinner, more polished and more lightly sculptured than the typical form. In colour it varies from pale yellowish grey or straw colour to dark reddish chestnut.

Altitude	..	..	23 mm.
Diam., major	..	..	6.5 ,,
Habitat—Andaman Islands.			

Mr. Warneford collected a large series of this shell, and as, with the exception of colour, there is no variation in size or texture, it would seem to be a well-marked local race and possibly even a distinct species.

*Melania charon*, sp. nov.

Shell elongately subulate, dark brownish black; remaining whorls 12, convex, marked throughout with lines of growth and spirally sculptured with faint, somewhat distant raised striæ; sutures well impressed; columella descending in a rounded curve and extending into a slight callus which reaches the lip above; peristome simple; aperture oblong ovate; interior slate colour.

Altitude	..	..	56 mm.
Diam., major	..	..	12 ,,
Aperture, alt.	..	..	11.75 ,,
,, diam.	..	..	7 ,,
Habitat—Andaman Islands.			

*Melania expatriata*, sp. nov.

Shell subulately turreted, dark blackish brown; remaining whorls  $4\frac{1}{2}$ , spirally striated on the lower half of the upper whorls; the body-whorl encircled by an infra-sutural ridge forming a distinct shoulder and weakly spirally lirate throughout below the ridge; sutures impressed; peristome simple; columella arched, a callus joining it with the lip above; aperture inversely auriform.

Altitude	..	..	33.25 mm.
Diam., major	..	..	12.25 ,,
Aperture, alt.	..	..	10.5 ,,
,, diam.	..	..	5.5 ,,
Habitat—Andaman Islands.			

The shoulder formed by the infra-sutural ridge presents a somewhat striking appearance and recalls some of the Western Pacific Island forms in which this character occurs; the other characters, however, when taken collectively or singly, easily separate it from any of the species described from those regions.

*Melania multistriata*, sp. nov.

Shell decollate, subulate, dark olive-brown; remaining whorls 4, rather flat, sculptured throughout with fine transverse striæ and coarser spiral striæ; sutures deep and incised; columella arched; peristome acute; aperture ovate; interior bluish grey.

Altitude .. ..	26 mm.
Diam., major .. ..	10 „
Aperture, alt. .. ..	9.5 „
„ diam. .. ..	4 „
Habitat—Andaman Islands.	

*Risella balteata*, sp. nov.

Shell conical, narrowly and deeply perforate, sharply carinate and slightly undulately waved at periphery, pale yellow with a broad pinkish yellow median band; whorls 4, somewhat convex, spirally striate; sutures impressed; base of shell flattened, spirally grooved and transversely striate; aperture obliquely sub-quadrate.

Altitude .. ..	1.75 mm.
Diam., major .. ..	3 „
Aperture, alt. .. ..	1.25 „
„ diam. .. ..	.75 „
Habitat—Andaman Islands.	

The above species may be compared with *Risella lutea*, Gld.; it is, however, much smaller, less undulately waved at the periphery and less coarsely striate on the upper whorls.

*Alaba warnfordiana*, sp. nov.

Shell turritiform, yellowish white; whorls 7—8, flat above, but slightly bulging over the sutures, spirally striate and indistinctly varicosely costulate; sutures impressed; aperture oval; peristome simple.

Altitude .. ..	4.5 mm.
Diam., major .. ..	1.5 „
Aperture, alt. .. ..	1 „
„ diam. .. ..	.5 „
Habitat—Andaman Islands.	

Allied to *A. blanfordi*, A. Ad., but has larger and fewer varices on the upper whorls; the spiral sculpture is also coarser than is the case with *A. blanfordi*.

*Rissoina angusta*, sp. nov.

Shell narrowly fusiform, solid, yellowish white; whorls 9, the first three smooth, the remainder transversely, obliquely ribbed; sutures impressed; aperture ovate; peristome somewhat sinuous.

Altitude .. ..	4.5 mm.
Diam., major .. ..	1.5 „
Habitat—Off Port Blair, Andaman Islands, 7—10 fathoms.	

*Rissoina cylindrica*, sp. nov.

Shell somewhat cylindrical, white with a brownish infra-sutural band; covered with a dull chocolate-coloured periostracum; remaining whorls 5, rather flat, sculptured with fine, transverse costæ and minute, spiral striæ, presenting a punctate appearance between the former; sutures impressed; aperture ovate; outer lip broadly thickened and somewhat expanded, a well-developed callosity joining the columella with the lip above.

Altitude	..	..	5.5 mm.
Diam., major	..	..	2 "
Aperture, alt.	..	..	2 "
" diam.	..	..	1 "
Habitat—Andaman Islands.			

*Rissoina læta*, sp. nov.

Shell elongately fusiform, dull white; whorls  $7\frac{1}{2}$ , the first  $5\frac{1}{2}$  very convex, the remaining 2 rather flat, sculptured throughout with fine, spiral striæ and oblique costæ, the latter becoming finer and almost obsolete on the last two whorls; columella descending rather obliquely and extending into a callus above; peristome varicosely thickened; aperture ovate.

Altitude	..	..	6.5 mm.
Diam., major	..	..	2.25 "
Aperture, alt.	..	..	2 "
" diam.	..	..	1 "
Habitat—Andaman Islands.			

*Rissoina pupiniiformis*, sp. nov.

Shell fusiform, somewhat flattened, semi-transparent white, polished; whorls 6, scarcely convex, encircled by a super-sutural spiral groove; sutures scarcely impressed; aperture oval; columella slightly arched; peristome simple, bearing one small basal denticle.

Altitude	..	..	6 mm.
Diam., major	..	..	3 "
" minor	..	..	2 "
Aperture, alt.	..	..	1.75 "
" diam.	..	..	1 "
Habitat—Andaman Islands.			

*Rissoina sculpturata*, sp. nov.

Shell decollate, fusiform, solid, whitish; remaining whorls  $4\frac{1}{2}$ , very flat, sculptured with transverse ribs interrupted by spiral ridges presenting a coarsely cancellate appearance; sutures scarcely defined; aperture ovate, oblique; peristome varicosely thickened; columella descending obliquely and extending into a callus which joins the lip above.

Altitude	..	..	45	mm.
Diam., major	..	..	2'25	..
Aperture, alt.	..	..	1	..
„ diam.	..	..	5	..
Habitat—Off Port Blair, Andaman Islands, 7—10 fathoms.				

*Rissoina warnefordiæ*, sp. nov.

Shell small, fusiform, yellowish white; whorls  $7\frac{1}{2}$ , rather convex, the first two smooth, shining, the remainder transversely ribbed and finely, spirally ridged, presenting a coarsely punctate appearance between the ribs; sutures impressed; aperture obliquely ovate; peristome simple; columella descending rather obliquely.

Altitude	..	..	3'5	mm.
Diam., major	..	..	1'25	..
Habitat—Off Port Blair, Andaman Islands, 7—10 fathoms.				

*Narica depressa*, sp. nov.

Shell depressed, white, solid; whorls 3, sculptured with closely set, oblique, arcuate costæ, crossed by fine liræ, presenting a cancellate appearance; umbilical area smooth; umbilicus wide and deep; aperture oval; peristome continuous, simple, except in the umbilical region where it is slightly reflexed.

Altitude	..	..	7'5	mm.
Diam., major	..	..	17	..
Aperture, alt.	..	..	11'5	..
„ diam.	..	..	8	..
Habitat—Andaman Islands.				

*Eulima balteata*, sp. nov.

Shell acuminate pyramidal, solid, slightly distorted by curved, polished, greyish white, bearing a broad band of pure white above the sutures and at the periphery of the body-whorl; whorls 15; sutures scarcely impressed; aperture obliquely lunate; a callosity extending from the columella to the lip above.

Altitude	..	..	6'75	mm.
Diam., major	..	..	1'75	..
Aperture, alt.	..	..	1'5	..
„ diam.	..	..	5	..
Habitat—Andaman Islands.				

*Styloptygma andamanensis*, sp. nov.

Shell subulate, greyish white, painted with an indistinct whitish, infra-sutural, spiral band, semi-transparent; whorls 10, marked

with transverse lines of growth; sutures impressed; aperture elongately oval; columella posteriorly plicate.

Altitude .. .. 6.75 mm.

Diam., major .. .. 1.75 "

Habitat—Andaman Islands.

In some measure resembling *Odostomia aciculina*, Souv.; it is, however, broader and the whorls increase more rapidly; it is also more transparent than that species, and, with the exception of the indistinct, whitish spiral band, the shell is devoid of painting.

*Menestho acuminata*, sp. nov.

Shell acutely turritiform, yellowish white; whorls 7, flat, regularly spirally striate; sutures scarcely impressed; aperture sub-quadrate; peristome simple.

Altitude .. .. 5 mm.

Diam., major .. .. 2 "

Aperture, alt. .. .. 1.5 "

„ diam. .. .. 1 "

Habitat—North Bay, Andaman Islands.

*Turbonilla foveolata*, sp. nov.

Shell acutely, elongately, turritiform, upper portion curved, distorted; pure white; remaining whorls 17½, flattish, the first eight increasing very slowly, sculptured with closely set transverse ribs and spiral striæ; base of shell spirally striate only; sutures well impressed; aperture sub-quadrate; peristome simple; columella sub-tortuous.

Altitude .. .. 14 mm.

Diam., major .. .. 3 "

Aperture, alt. .. .. 2 "

„ diam. .. .. 1 "

Habitat—Andaman Islands.

*Leptothyra solida*, sp. nov.

Shell globosely turbonate, very solid, narrowly perforate, rather flat at the apex, yellowish white, transversely streaked with small blotches of reddish brown; whorls 3½, spirally lirate throughout; sutures impressed; peristome simple; aperture sub-circular; operculum shelly, slightly concave, pauci-spiral with a central nucleus.

Altitude .. .. 2.5 mm

Diam., major .. .. 3 "

Aperture, alt. .. .. 1.25 "

„ diam. .. .. 1 "

Habitat—Off Port Blair, Andaman Islands, 7—10 fathoms.



*Gibbula athena*, sp. nov.

Shell turbinately conical, angled at the periphery, dark bronze colour, painted with oblique, transverse, thin, yellowish white lines, a row of cream-coloured spots encircling the umbilical area; whorls 4, finely, spirally striate above; base of shell bearing several spiral liræ which are crossed by fine, transverse striæ; sutures impressed; umbilicus deep and fairly wide; columella arched; peristome simple; aperture sub-ovate; operculum horny, multi-spiral, with a central nucleus.

Altitude .. .. 4.5 mm.

Diam., major .. .. 3.5 "

Aperture, alt. .. .. 2 "

,, diam. .. .. 1.5 "

Habitat—Off Port Blair, Andaman Islands, 7—10 fathoms.

Allied to *G. phædra*, Melvill, from the Mekran Coast; the spire is, however, more obtuse and the sculpture coarser below and finer above; the whorls are also more convex than is the case in *G. phædra*.

*Gibbula cæni*, sp. nov.

Shell perforate, turbinately conical, yellowish grey; whorls 5, shouldered above, flattish below, sculptured with coarse spiral liræ crossed by transverse striæ, presenting a cancellate appearance; sutures not very well defined; umbilicus rather broad, deep; aperture sub-circular; edge of peristome acute, a thickening appearing just within the aperture.

Altitude .. .. 3.50 mm.

Diam., major .. .. 3.25 "

Aperture, alt. .. .. 1.25 "

,, diam. .. .. 1 "

Habitat—Off Port Blair, Andaman Islands, 7—10 fathoms.

*Margarita ponsonbyi*, sp. nov.

Shell small, globosely depressed, pale greenish, iridescent, white, painted with oblique, interrupted bands of dark green; whorls 4, very finely, spirally striate, and transversely marked with lines of growth; sutures impressed; umbilicus narrow, partly concealed by the projection of the columella; columella arched; peristome acute; aperture almost circular.

Altitude .. .. 3.5 mm.

Diam., major .. .. 4.25 "

Aperture, alt. .. .. 2.25 "

,, diam. .. .. 2 "

Habitat—Off Port Blair, Andaman Islands, 7—10 fathoms.

An extremely beautiful little species and easily distinguished from any other member of the group. Just inside the aperture appear two shelly ridges, probably the remains of the outer lip at past rest periods.

*Solariella dulcissima*, sp. nov.

Shell depressedly conoid, somewhat obtusely keeled, white, painted above with large blotches of crimson, narrow radiating bands of the white ground colour appearing at irregular intervals between these; base of shell painted with rows of dark crimson dashes and flecked with spots and blotches of a lighter shade of the same colour between the rows and towards the periphery; whorls  $4\frac{1}{2}$ , sculptured throughout with very fine, spiral liræ crossed by minute transverse striæ giving a finely granular appearance to the shell; sutures impressed; umbilicus moderately wide, bordered by two coarse whitish ribs, the lower and coarser of which is nodulous; aperture roundly ovate; peristome simple; interior of shell iridescent, spirally striate.

Altitude .. .. 4 mm.

Diam., major .. .. 6.75 ,,

Aperture, alt. .. .. 3 ,,

„ diam. .. .. 2.75 ,,

Habitat—Off Port Blair, Andaman Islands, 7—10 fathoms.

A comparison may be made between this species and *S. variabilis*, A. Ad.; it is, however, thinner in texture, flatter and more keeled at the periphery; the umbilicus is also narrower and the general sculpture is much finer than in *S. variabilis*.

*Stomatella crenulata*, sp. nov.

Shell roundly auriform, somewhat depressed, pale pinkish yellow, mottled with oblique streaks and blotches of crimson fading to red and green; whorls 5, sculptured with light spiral ridges; the interstices marked with fine, wavy, spiral striæ except on the base of the shell where these last are absent, both crossed with transverse striæ presenting a slightly beaded or granular appearance; sutures crenulate above, incised below; columella descending obliquely in a rounded curve; umbilical region surrounded by a broad white callus; peristome acute; interior of shell highly iridescent.

Altitude .. .. 12 mm.

Diam., major .. .. 19.75 ,,

„ minor .. .. 15.25 ,,

Aperture, alt. .. .. 10 ,,

„ diam. .. .. 11.5 ,,

Habitat—Andaman Islands.

*Macroschisma elegans*, sp. nov.

Shell oblong, yellowish white, rayed and blotched with rose colour, cancellated with concentric and transverse striæ, the latter becoming much coarser anteriorly; fissure straight below, narrowing towards the apex, a wide, shallow, white channel leading from it to the posterior margin; peristome acute anteriorly, thick posteriorly and laterally.

Altitude ..	2.25 mm.
Diam., major ..	10 ..
„ min. ..	4.25 ..
Habitat—Andaman Islands.	

*Lucapinella gaylordæ*, sp. nov.

Shell oblong ovate, laterally contracted, posteriorly somewhat dilated, greenish white, irregularly rayed with blackish brown, roughly sculptured with scaly radiate ribs and concentric grooves: fissure ovate, contracted near both ends; peristome laterally blunt, acute at the ends; interior of shell white; callus-rim of fissure thick, crenulate.

Diam., major ..	10.75 mm.
„ minor ..	5.25 ..
Altitude ..	3 ..
Habitat—Andaman Islands.	

*Acmæa semicornea*, sp. nov.

Shell semicorneous, depressedly conical, irregularly subquadrate, pale yellowish brown, sculptured with fine radiating transverse ribs crossed by concentric striæ, presenting a very finely cancellate appearance; edge of peristome finely crenulate; apex simple, placed slightly to one side; anterior end of shell shortened; posterior end broadly produced.

Altitude ..	2 mm.
Diam., major ..	9 ..
„ minor ..	7.75 ..
Habitat—Andaman Islands.	

Allied to *Sutura fluviatilis*, Blanf.,<sup>1</sup> from the delta of the Irrawady river; the apex of the present species is, however, less central, the sculpture is much finer and more cancellate, the general texture is also more horny and the peristome is crenulate, which does not appear to be the case in *S. fluviatilis*.

Of three young specimens of this species in the British Museum labelled "Andaman Islands," and presented by Colonel L. Worthington Wilmer, one bears traces of being rayed with rusty brown, a

<sup>1</sup> Journ. Asiat. Soc. Bengal, xxxvi, pt. 2, 1867; p. 62; pl. ii, figs. 2—4.

character which is quite absent in the remaining two and in those in the Warneford collection. There is also a note attached to the British Museum specimens stating that they were found attached to *Mytilus*, but there is no means of ascertaining how Mr. Warneford's specimens were actually obtained.

*Chlamys andamanicus*, sp. nov.

Shell ovate, nearly equilateral, bright orange colour throughout, streaked and flecked especially on the upper part of the shell with white, both valves bearing about 60 fine, closely set, scaly riblets; auriculæ small, very unequal, the anterior large, curved below, the posterior sloping obliquely, both sculptured with scaly riblets.

Long.	..	..	16·5 mm.
Lat.	..	..	13·75 ,,
Habitat—Andaman Islands.			

*Modiola cymbula*, sp. nov.

Shell elongately trapezoidal, pale yellowish brown, except at posterior end of ventral surface where it is of a pale reddish chestnut colour, concentrically striate with lines of growth, the posterior ventral surface longitudinally wrinkled; anterior lateral margin almost straight; posterior lateral margin sloped; ventral margin contracted towards the middle; umboes small, purple; interior of shell pale flesh colour, rapidly deepening to purple and blackish purple towards the dorsal region.

Long.	..	..	28·25 mm.
Lat.	..	..	14 ,,
Habitat—Andaman Islands.			

*Modiola zebra*, sp. nov.

Shell mytiliform, curved, red elegantly rayed with bluish black inequidistant stripes, stained and polished with rich chestnut at the posterior side of the ventral margin, concentrically striate with irregular lines of growth; posterior side short, contracted; anterior side fan shaped; umboes high, narrow, whitish.

Long.	..	..	55 mm.
Lat.	..	..	27 ,,
Habitat—Andaman Islands.			

Allied to *M. gubernaculum*, Dunk.,<sup>1</sup> of which the habitat is unknown; it is, however, more elongately oblong, and the system of painting is quite different; the umboes also are much narrower and higher and do not show the purple colouring so conspicuous in that species.

<sup>1</sup> *Proc. Zool. Soc. London*, 1856, p. 361.

*Barbatia cancellata*, sp. nov.

Shell acuminate ovate, very inequilateral, gaping towards the anterior side, sculptured with oblique transverse ribs and somewhat distant concentric ridges, covered with a yellowish brown periostracum, a tuft of bristly hairs appearing posteriorly at the points of contact of the transverse ribs and concentric ridges; anterior side somewhat truncate; posterior side produced, roundly acuminate; dorsal margin straight; ventral margin anteriorly very oblique, posteriorly rounded; umboes broad, rather prominent.

Long.            ..            .. 13 mm.  
 Lat.            ..            .. 24°5',  
 Habitat—Andaman Islands.

*Crassatella radiata*, Sow., var. *obsoleta*, var. nov.

Differing from the typical form in almost totally lacking the coloured rays which are so conspicuous a character of the species; in the present variety these only appear as indistinct spots and small blotches of a pale rusty red.

Habitat—Andaman Islands.

*Kellia mirabilis*, sp. nov.

Right valve oblong-subquadrate, rather tumid, inequilateral, yellowish white, with a broad bluish white central oblique band extending from the umboes to the ventral margin, sculptured throughout with wavy punctate ridges presenting a curious and beautifully fine, granular appearance; anterior side rather short, rounded; posterior side more angularly rounded; ventral margin straight.

Long.            ..            .. 11 mm.  
 Lat.            ..            .. 15°25',  
 Habitat—Andaman Islands.

It is impossible to adequately describe the wonderful sculpture of this shell which is so striking in every way and so widely different from any hitherto described species of the genus, that I have considered the single valve represented in the Warneford collection worthy of special notice and description.

*Scintilla citrina*, sp. nov.

Shell oval, translucent, pale lemon colour, concentrically striate with lines of growth, faintly scratched with very fine transverse striæ; anterior side rounded; posterior side slightly acuminate below; lateral margin sloped; umboes small but prominent.

Long.            ..            .. 7 mm.  
 Lat.            ..            .. 10',  
 Habitat—Andaman Islands.

*Scintilla elongata*, sp. nov.

Shell oblong-elongate, nearly equilateral, rather convex, gaping in the middle, concentrically striate, polished, semi-transparent white, minutely freckled throughout with opaque milk-white spots; anterior side rounded; posterior side somewhat angularly rounded; dorsal margin straight; ventral margin contracted in the middle.

Long.            ..            ..        6 mm.  
 Lat.            ..            ..        13    ,,  
 Habitat—Andaman Islands.

*Scintilla perplexa*, sp. nov.

Shell oblong, nearly closed, semi-transparent, cream colour, finely, concentrically striate and bearing traces of very fine oblique, transverse striæ; anterior side obtusely angled; posterior side rather larger than anterior side, somewhat squarely rounded, expanded above and more inflated.

Long.            ..            ..        7 mm.  
 Lat.            ..            ..        11.5    ,,  
 Habitat—Andaman Islands.

*Scintilla translucida*, sp. nov.

Shell roundly ovate, moderately compressed, very thin, transparent, marked with very minute transverse striæ and concentric lines of growth, some of which are milky white; slightly gaping at both ends; umboes small, nearly central.

Long.            ..            ..        11 mm.  
 Lat.            ..            ..        15    ,,  
 Habitat—Andaman Islands.

Allied to *S. jukesi*, Desh., from Australia; the present species is, however, much thinner, more transparent and more roundly ovate; it is also polished, whereas *S. jukesi* is quite dull and opaque.

*Hemicardium hystrix*, Reeve, var. *brevispinosa*, var. nov.

Distinguished from the typical form by its much shorter and more closely set spines, and by the absence of the scarlet lines in the interstices between the ribs; the pink colouring is also confined to the extreme umbonal region and lateral margins.

Habitat—Andaman Islands.

All the specimens examined from the Andamans are identical in these respects, and it appears to be a well-marked local variety.

*Tapes albomarginata*, sp. nov.

Shell ovate, flesh coloured, obsoletely rayed with purple, sculptured with regular, prominent, raised liræ; anterior side somewhat angularly rounded; posterior side almost truncately obtuse; dorsal margins gently sloped; lateral and ventral margins creamy white; umboes small, white, stained with pale, livid purple.

Long.            ..            ..    24 mm.

Lat.            ..            ..    36.5 "

Habitat—Andaman Islands.

*Batissa capillata*, sp. nov.

Shell sub-trigonal, inequilateral, thick, rather inflated, covered with a dark, brownish black periostracum except in the umbonal region where erosion has taken place, sculptured with coarse, irregular, concentric growth-lines which are obliquely crossed posteriorly with coarse hair-like ridges; anterior side somewhat angularly rounded; posterior side slightly produced, obscurely angled; ventral margin rounded; ligament large, prominent; cardinal teeth broad and very coarse; anterior lateral teeth elongated, finely striate; interior of shell purplish white, the purple staining deepening posteriorly.

Long.            ..            ..    74 mm.

Lat.            ..            ..    72 "

Habitat—Andaman Islands.

*Diplodonta insulsa*, sp. nov.

Shell obliquely sub-ovate, yellowish white, marked with fine, concentric growth-lines; anterior side obliquely rounded; posterior side rounded; dorsal margins gently sloped; ventral margin rounded; umboes small, not prominent.

Long.            ..            ..    8.5 mm.

Lat.            ..            ..    10 "

Habitat—Andaman Islands.

*Donax nuxjagus*, sp. nov.

Shell elongately oblong, yellowish flesh coloured, sculptured with fine, closely set transverse striæ and posteriorly with irregular, concentric grooves disappearing towards the middle of the shell; anterior side produced, rounded; posterior side acuminate rounded; anterior lateral margin gently sloped; posterior lateral margin more abruptly sloped; ventral margin undulately rounded; umboes rather large, livid purple.

Long.            ..            ..    8 mm.

Lat.            ..            ..    13.25 "

Habitat—Andaman Islands.

*Donax tiesenhauseni*, sp. nov.

Shell wedge shaped, yellowish, rayed with greyish purple, sculptured with very fine, concentric striae and fine nearly obsolete transverse striae, both becoming so much coarser posteriorly as to give that part of the shell a cancellate appearance; anterior side produced, obtusely rounded; posterior side abruptly truncate; anterior lateral margin gently, concavely sloped; posterior lateral margin arched; ventral margin straight; umboes white.

Long. . . . . 8.5 mm.

Lat. . . . . 13 „

Habitat—Andaman Islands.

*Donax trigonalis*, sp. nov.

Shell almost trigonal, convex, very truncate, pale bluish flesh colour, tinged posteriorly with livid purple, partly covered with a thin, yellowish periostracum, sculptured with fine concentric lines of growth and posteriorly with fine longitudinal striae which become gradually coarser, giving to this part of the shell a cancellate appearance; anterior lateral margin sloped; posterior margin descending very abruptly; ventral margin rounded; umboes large, but not prominent; interior of shell pale flesh colour, changing to blackish purple in places.

Long. . . . . 9.5 mm.

Lat. . . . . 11 „

Habitat—Andaman Islands.

This species differs from *Donax incarnatus*, Chem., to which it appears to be most nearly related, by its more truncate form, more rounded ventral and straighter posterior margins.

*Psammobia obtusa*, sp. nov.

Shell ovately transverse, pale mauve, blotched and mottled with a darker shade of the same colour and rayed with interrupted bands of reddish violet, sculptured throughout with fine, concentric striae and oblique ridges which appear as irregular, waved plications posteriorly; posterior side obtusely angled; anterior side rounded; umboes central; interior of shell mauve throughout.

Long. . . . . 24.5 mm.

Lat. . . . . 42 „

Habitat—Andaman Islands.

The present species at first sight recalls *P. ornata*, Desh.; it is, however, broader, shorter and more blunt on both sides than is that species, the mauve colour also easily distinguishes it from *P. ornata*, which is of a yellowish white colour; the coloration of the interior is also remarkable.



*Novaculina andamanensis*, sp. nov.

Shell oblong, elongate, inequilateral, constricted towards the middle, pure white, bearing traces of having been covered with a yellowish brown periostracum, concentrically striate; dorsal margin slightly sloped anteriorly; ventral margin excavated in the middle, anterior side rounded; posterior side produced, somewhat angled below; umboes small.

Long.            ..            .. 16.5 mm.  
 Lat.            ..            .. 37.5 ,,  
 Habitat—Andaman Islands.

*Tellina cancellata*, sp. nov.

Shell white, roundly ovate, sculptured with fine, radiate ribs and concentric ridges presenting a delicately cancellate appearance; posterior side slightly acuminate; anterior side rounded.

Long.            ..            .. 9.5 mm.  
 Lat.            ..            .. 12 ,,  
 Habitat—Andaman Islands.

This species may be separated from *S. pretiosa*, Desh. (= *costata*, Sow.), its nearest relation, by its more oval form, less pointed posterior side and much finer and more delicate sculpture.

*Tellina incisa*, sp. nov.

Shell elongately oval, white, discoloured towards the umbona region with reddish yellow, shining, slightly iridescent, sculptured with concentric lines of growth and indistinct, irregular transverse striæ; anterior side somewhat acuminate; posterior side bluntly beaked below, concavely truncate above, a notch appearing just above the termination of the beak which is stained a ferruginous brown; umboes small, inconspicuous.

Long.            ..            .. 12 mm.  
 Lat.            ..            .. 20.75 ,,  
 Habitat—Andaman Islands.

*Tellina jousseaumei*, sp. nov.

Shell roundly ovate, sub-equilateral, nearly equivalve, the left valve somewhat compressed, chalky white, bearing traces of a pale, greenish brown periostracum, marked with rather coarse concentric lines of growth and very fine, transverse striæ; anterior side rounded; posterior side more sharply rounded, flexuous, obtusely angled above; umboes small, central.

Long.            ..            .. 32.5 mm.  
 Lat.            ..            .. 39 ,,  
 Habitat—Andaman Islands.

*Tellina magnifica*, sp. nov.

Shell oblong ovate, white, polished, shining, inequilateral, concentrically striate with lines of growth crossed by fine, transverse oblique striæ, presenting a very finely cancellate appearance, especially in those regions which border on the lower and lateral margins of the right valve; anterior side acuminate rounded; posterior side produced, flexuous, rostrate; ventral margin slightly rounded; umboes small, rose coloured.

Long.            ..            .. 47 mm.

Lat.            ..            .. 73° 75' "

Habitat—Andaman Islands.

*Strigilla densestriata*, sp. nov.

Shell sub-trigonal, slightly inequivalve, cream coloured, slightly flexuous posteriorly, sculptured on both valves anteriorly with concentric grooves, centrally with very fine, concentric striæ, crossed by fine oblique transverse grooves, and posteriorly with very fine, transverse striæ, and concentric grooves, the latter becoming much coarser near the margin; posterior margin descending obliquely and rather abruptly; anterior margin less abrupt; ventral margin rounded; umboes small.

Long.            ..            .. 14·5 mm.

Lat.            ..            .. 17 "

Habitat—Andaman Islands.





# EXPLANATION OF PLATE XIV.

- |   |  |
|---|--|
| FIG. 1. <i>Rissoina angusta</i> .                   | FIG. 12. <i>Margarita ponsonbyi</i> .                          |
| „ 2. <i>Rissoina cylindrica</i> .                   | „ 13. <i>Risella balteata</i> .                                |
| „ 3. <i>Rissoina læta</i> .                         | „ 14. <i>Solariella dulcissima</i> .                           |
| „ 4. <i>Rissoina pupiniformis</i> .                 | „ 15. <i>Stomatella crenulata</i> .                            |
| „ 5. <i>Rissoina sculpturata</i> .                  | „ 16. <i>Tapes albomarginata</i> .                             |
| „ 6. <i>Rissoina warnefordiæ</i> .                  | „ 17. <i>Modiola zebra</i> .                                   |
| „ 7. <i>Nassa gerstenbrandti</i> .                  | „ 18. <i>Modiola cymbula</i> .                                 |
| „ 8. <i>Nassa jucunda</i> .                         | „ 19. <i>Chlamys andamanicus</i> .                             |
| „ 9. <i>Nassa tristis</i> .                         | „ 20. <i>Strigilla densestriata</i> .                          |
| „ 10. <i>Styloptygma andaman-</i><br><i>ensis</i> . | „ 20A. <i>Strigilla densestriata</i><br>(sculpture magnified). |
| „ 11. <i>Sitala densellata</i> .                    | „ 21. <i>Tornatina conspicua</i> .                             |



ANDAMAN SHELLS.





EXPLANATION OF PLATE XV.

- |                                      |                                     |
|--------------------------------------|-------------------------------------|
| FIG. 22. <i>Melania charon</i> .     | FIG. 30. <i>Columbella suavis</i> . |
| „ 23. <i>Melania expatriata</i> .    | „ 31. <i>Haminia callosa</i> .      |
| „ 24. <i>Melania multistriata</i> .  | „ 32. <i>Lucapinella gaylordæ</i> . |
| „ 25. <i>Mangilia obtusa</i> .       | „ 33. <i>Macroschisma elegans</i> . |
| „ 26. <i>Mangilia andamanensis</i> . | „ 34. <i>Drillia fraga</i> .        |
| „ 27. <i>Mangilia exasperata</i> .   | „ 35. <i>Drillia sikesi</i> .       |
| „ 28. <i>Conus edwardi</i> .         | „ 36. <i>Eulima balteata</i> .      |
| „ 29. <i>Clathurella selli</i> .     | „ 37. <i>Gyrineum wilmeriana</i> .  |
| FIG. 38. <i>Menestho acuminata</i> . |                                     |





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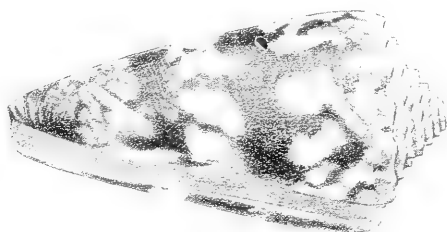
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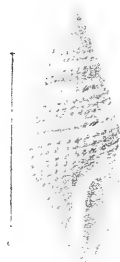
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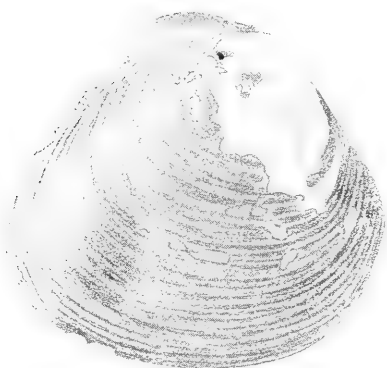
38





# EXPLANATION OF PLATE XVI.

- |  |                                    |
|--|------------------------------------|
| FIG. 39. <i>Batissa capillata</i> .                | FIG. 48A. <i>Kellia mirabilis</i>  |
| „ 40. <i>Novaculina andaman-</i><br><i>ensis</i> . | (sculpture magnified).             |
| „ 41. <i>Psammobia obtusa</i> .                    | „ 49. <i>Alaba warnefordiana</i> . |
| „ 42. <i>Gibbula cœni</i> .                        | „ 50. <i>Atys convexa</i> .        |
| „ 43. <i>Gibbula ahena</i> .                       | „ 51. <i>Atys neglecta</i> .       |
| „ 44. <i>Leptothyra solida</i> .                   | „ 52. <i>Atys pacei</i> .          |
| „ 45. <i>Narica depressa</i> .                     | „ 53. <i>Atys vixumbilicata</i> .  |
| „ 46. <i>Acmaea semicornea</i> .                   | „ 54. <i>Diplodonta insulsa</i> .  |
| „ 47. <i>Barbatia cancellata</i> .                 | „ 55. <i>Donax nuxfagus</i> .      |
| „ 48. <i>Kellia mirabilis</i> .                    | „ 56. <i>Donax tiesenhauseni</i> . |
|  | „ 57. <i>Donax trigonalis</i> .    |



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EXPLANATION OF PLATE XVII.

- |  |  |
|--|--|
| FIG. 58. <i>Tellina cancellata</i> .                       | FIG. 64. <i>Terebra rubrobrunnea</i> . |
| „ 58A. <i>Tellina cancellata</i><br>(sculpture magnified). | „ 65. <i>Terebra unicolor</i> .        |
| „ 59. <i>Tellina incisa</i> .                              | „ 66. <i>Turbonilla foveolata</i> .    |
| „ 60. <i>Tellina jousseaumei</i> .                         | „ 67. <i>Mitra warnefordiana</i> .     |
| „ 61. <i>Tellina magnifica</i> .                           | „ 68. <i>Mitra emiliæ</i> .            |
| „ 62. <i>Pleurotoma rimata</i> .                           | „ 69. <i>Scintilla translucida</i> .   |
| „ 63. <i>Terebra carnicolor</i> .                          | „ 70. <i>Scintilla citrina</i> .       |
|  | „ 71. <i>Scintilla elongata</i> .      |
|  | FIG. 72. <i>Scintilla perplexa</i> .   |





ANDAMAN SHELLS.



#### ERRATA.

Page 249, line 5 from bottom. *For* "figs. 2 and 3" *read* "figs. 2 and 1."

,, 253, under "Mishmi average" and opposite "Length of horn." *For* "571" *read* "509."



## XXIV. THE FAUNA OF BRACKISH PONDS AT PORT CANNING, LOWER BENGAL.

PART X.—DECAPOD CRUSTACEA, WITH AN ACCOUNT OF A SMALL  
COLLECTION FROM BRACKISH WATER NEAR CALCUTTA AND  
IN THE DACCA DISTRICT, EASTERN BENGAL.

By DR. J. G. DE MAN, *Ierseke, Holland.*

The collection of Decapod Crustacea, chiefly gathered in brackish water ponds at Port Canning, comprises eleven species, three of which are new to science. Very interesting are also the numerous specimens of *Palæmon lamarrei*, H. M. Edw., a species that, since its first description in 1837, did no more appear in literature, or that has been misunderstood.

The collected species are the following :—

*Scylla serrata* (Forsk.), de Haan.

*Tympanomerus stapletoni*, sp. nov.

*Pachygrapsus propinquus*, sp. nov.

*Varuna litterata* (Fabr.), M. Edw.

*Metaplex dentipes* (Heller).

*Leander*, sp.

*Palæmon* (*Eupalæmon*) *lamarrei*, H. M. Edw.

*Palæmon*, sp.

*Caridina*, sp.

*Caridina propinqua*, sp. nov.

*Caridina nilotica* (Roux), var. *bengalensis*, var. nov.

The last-mentioned species is described in another paper, which appears at p. 255 of this Journal, entitled “On *Caridina nilotica* (Roux) and its varieties.”

### I. *Scylla serrata* (Forsk.), de Haan.

*Scylla serrata* (Forsk.), de Haan, Alcock, “Materials for a Carcinological Fauna of India,” No. 4, pt. ii, Calcutta, 1899, p. 27 (*ubi synonym.*).

Two young males and a female of medium size from Port Canning (estuary of the Matla River).

The carapace of the female is 95 mm. broad and 64 mm. long. Outer angle of the wrist of the chelipedes with one small spine. In the smaller of the two males the last antero-lateral spine of the carapace is distinctly larger than the rest ; the distance between the tips of these teeth, *i.e.*, the greatest breadth of the carapace, mea-

tures 20 mm., whereas it is 13·3 mm. long without the abdomen. Frontal lobes rounded, little prominent. In the other male, the carapace of which is 38 mm. broad and 25·5 mm. long, the last antero-lateral tooth is hardly larger than the rest and the four frontal lobes are already triangular, the lateral lobes being subacute. In this specimen the anterior margin of the right chelipede carries four spines, that of the left, as usually, three; in both males there is also but one small spine on the outer side of the wrist.

2. *Tympanomerus stapletoni*, sp. nov.

(Plate xviii, fig. 1.)

Forty-seven males and fifteen females, four of which are egg-bearing. They were collected by Mr. H. E. Stapleton in the Dacca District from a tidal river, the water of which is more or less brackish throughout the year.

Reg. No.  $\frac{5137}{10}$ .

As has already been observed by Col. Alcock (*Journal Asiatic Soc. Bengal*, vol. lxi, pt. ii, No. 3, 1900, p. 371) the name *Tympanomerus* is a most unfortunate one, for, both in *Tymp. orientalis* (de M.) and in the present species, there are no tympana on the meropodites of the ambulatory legs; it is only in *Tymp. pusillus* (de Haan), from Japan, that small tympana exist on the meropodites of the last pair of legs. Specimens of *Tymp. orientalis* and *Tymp. pusillus* are lying before me. *Tymp. stapletoni* is intermediate in size between the two other species; it is somewhat larger than *Tymp. orientalis* but it does not attain the size of *Tymp. pusillus*. Both in the male and in the female the distance between the outer orbital angles is *one-fifth* longer than the length of the carapace, the epistome excluded. From the middle of the cardiac region the upper surface gradually slopes down towards the fronto-orbital margin and towards the moderately deflexed front. As in the two other species, the intestinal region, which is smooth and obliquely deflexed downward, is bounded anteriorly by a transverse ridge that runs between the coxæ of the fifth pair of legs; the intestinal area appears in *Tymp. stapletoni* higher (longer) in proportion to its breadth than in the two other species. Whereas in *Tymp. stapletoni* the transverse ridge runs quite parallel with the posterior margin of the carapace, it curves, laterally, a little backward in *Tymp. pusillus*; the posterior margin of the carapace measures, in *Tymp. stapletoni*, two-thirds the distance between the outer orbital angles. The other regions are not or very indistinctly defined. Somewhat nearer to the transverse ridge just described than to a line uniting the outer angles of the orbits, the shallow, transverse, median part of the cervical groove is situated, which median part is interrupted in the middle. The depressed upper surface is marked with transverse, symmetrically arranged, short, impressed lines, which are more numerous on the lateral regions than on the

gastric area; they are wanting on the deflexed, somewhat pubescent, branchial regions and near the transverse, intestinal ridge. On the lateral regions of the carapace these lines are situated on transverse, pubescent ridges and prominences with crenulated margins. The anterior margin of the front measures one-fourth the distance between the outer orbital angles, and reaches in the middle further forward than at its rounded lateral angles; the lateral margins of the front are first slightly directed inward and then pass with a regular curve into the sinuous, transverse, upper margin of the orbits. The upper surface of the front is broadly and rather deeply grooved in the middle, whereas the lateral parts carry five or six oblique, impressed lines at either side.

The orbits are *transverse* as in *Tymp. orientalis* and almost once and a half as broad as the front. The antero-lateral portion of the lateral borders of the carapace, formed by the extraorbital and by the epibranchial tooth, slightly diverges, whereas the postero-lateral portion slightly converges backward. The outer margin of the extraorbital tooth is at a right angle with the upper orbital margin, so that the extraorbital tooth is not very sharp and moderately prominent. The epibranchial tooth, hardly discernible when the carapace is looked at from above, appears, in a lateral view of the latter (fig. 1c), as a tooth larger than the extraorbital one, from which it is separated by a deep, vertical notch, the anterior margin of the epibranchial tooth being at a right angle with the outer margin of the other. Whereas the margins of the extraorbital and of the epibranchial tooth are rather sharp and continuous, the postero-lateral margins are often interrupted and appear therefore ill defined; the oblique, ciliated line on the sides of the carapace is directed towards the posterior end of the epibranchial tooth. In *Tymp. pusillus* the postero-lateral margin is well defined and the epibranchial tooth is obtuse, but quite visible from above, as it projects laterally beyond the small extraorbital tooth; this is also the case in *Tymp. orientalis*, but the divergent, antero-lateral margin is here much longer, and the oblique, ciliated line runs to the middle of the lateral border of the carapace (compare de Man, *Zoolog. Jahrb.* (Spengel), iv, 1889, p. 448).

Eye peduncles stout, smooth, transverse; eyes terminal. Antennules folding obliquely. Lobe or tooth on the posterior margin of the epistome triangular, acute, very prominent. Lower margin of the orbits finely serrated, running nearly as in *Tymp. pusillus*, but less prominent; no tooth therefore at the outer angle, as is observed in *Tymp. orientalis*. Pterygostomian region finely granulated and ciliated, as in *Tymp. pusillus*, but the lower, oblique groove that runs from the antero-external angle of the buccal frame obliquely backward, is very shallow and situated nearer to the lower orbital margin than to the lateral margin of the buccal frame, whereas in *Tymp. pusillus* it runs farther distant from the orbital margin than from the buccal frame.

Posterior margin of the buccal frame (fig. 1b) once and a half as broad as the distance between its antero-external angles, and

measuring two-thirds the greatest width. External maxillipeds shutting closely together. Ischium a little broader than long, its antero-internal angle produced, antero-external corner situated lower than the rest of the surface and bounded by a hairy line that runs obliquely from the outer margin to the antero-internal angle. Merus a little longer than the ischium and, though slightly broader than long, hardly as broad as the latter; this joint is sculptured with a sort of Y-shaped sulcus starting from the antero-external angle, as in *Tymp. orientalis*, but the outer branch is shorter and reaches hardly beyond the middle of the joint. Carpus ovate, concave, two last joints cylindrical. The outer margin of merus and ischium combined is regularly arcuate. Exognath completely concealed.

Sternum and abdomen are smooth. The abdomen (fig. 1d) of the male, which somewhat more resembles that of *Tymp. orientalis* than that of *Tymp. pusillus*, is 7-jointed. The terminal or seventh segment is, in the adult male, 1.5 mm. long,<sup>1</sup> and its posterior margin is 1.35 mm. broad; the lateral margins are a little concave and the tip is rounded. The penultimate segment, 1.1 mm. long, is a little shorter than the terminal, and as its lateral margins are convex, it presents its greatest breadth of 1.88 mm. in the middle, appearing almost twice as broad as long. The fifth joint is 1.52 mm. long, *i.e.*, as long as the terminal segment, and, *being strongly constricted just behind the middle*, appears *time-glass-shaped*; the anterior margin of this joint is 1.6 mm. broad, the posterior 1.72 mm. and at the constriction it is 1.1 mm. broad. The fourth joint is 0.96 mm. long, two-thirds of the preceding and its straight, posterior margin, 2.52 mm. broad, is  $2\frac{1}{2}$ -times as broad as this joint is long. The third joint is 1.14 mm. long, a little longer than the fourth, and, as its margins are somewhat arcuate, it is 3.1 mm. broad, also two and a half times as broad as long, like the preceding segment. The second segment is very short, 0.62 mm. long, half as long as the third and 2.76 mm. broad. The first joint, finally, is the shortest and the broadest of all, 0.32 mm. long and 3.2 mm. broad; the posterior margin of the sternum, however, between the coxæ of the fifth legs, is 4.6 mm. broad.

The broad abdomen of the female much resembles that of *Tymp. pusillus*; the terminal joint, which is rounded at the tip, is 1.04 mm. long and its posterior margin is 1.9 mm. broad.

Chelipedes equal both in the male and in the female. The chelipedes of the male (fig. 1) more resemble those of *Tymp. pusillus* (de Haan) than those of *Tymp. orientalis*; they are just twice the length of the carapace and are thus rather short. The margins of the arm are unarmed, but they are granular, especially the upper one, the outer surface is nearly smooth, though a few microscopical granules are scattered on it, mostly near the upper margin; the granules are only visible by means of a lens. The upper surface of the carpal joints, which resemble those of *Tymp. pusillus*,

<sup>1</sup> All the joints are measured in the middle.



is smooth, their inner border is unarmed but microscopically granular, and one observes also a tuft of hair on the inner side just below the inner margin. Measured horizontally, the length (6.4 mm.) of the chelæ (fig. 1e) appears equal to that of the carapace, whereas the fingers, measuring one-third that length, appear half as long as the palm; the palm, 4.4 mm. long and 3 mm. high, is a little longer than high and the chelæ are, therefore, twice as long as high. The very finely granulated upper margin of the palm is obtuse, but in *Tymp. pusillus* the upper margin appears slightly compressed; the convex, outer surface of the palm is nearly smooth, but the rounded lower border appears again very finely granular, when examined under a lens, and this fine granulation extends nearly to the end of the immobile finger. Like the outer, so also the inner surface of the palm is marked with dark reticulate lines; on the inner surface these lines are finely granular. The straight, upper margin of the very oblique dactylus is also finely granular, but the granules are wanting along the middle line; the outer surface is slightly convex, smooth, somewhat punctate, and the prehensile edge carries eleven or twelve small teeth of equal size along its whole length. In *Tymp. pusillus* the outer side of the immobile finger is obtusely carinate longitudinally, though the granulate carina does not reach to the tip; in *Tymp. stapletoni* this carina is hardly discernible and the outer side of the finger is smooth; the immobile finger which is in a line with the lower margin of the palm is also finely denticulate like the dactylus. The fingers, which have slightly excavated tips, are, in younger males, comparatively longer.

The chelipedes of the female that are shorter than the legs, resemble those of *Tymp. pusillus*; the chelæ are half as long as the length of the carapace and the fingers that have broad-tipped, spoon-shaped extremities are slightly longer than the palm; the immobile finger is carinate longitudinally on its outer side.

The two middle pairs of ambulatory legs are a little longer than the others; in the adult male the legs of the antepenultimate pair are just twice as long as the distance between the outer orbital angles. *Tymp. stapletoni* is a species in which the meropodites carry no trace at all of "tympana," and proves more than any other the unfitness of the name of the genus. The meropodites are moderately dilated, so, e.g., are those of the antepenultimate pair little more than twice as long as broad, being 5 mm. long and 2.25 mm. broad in the middle. Their unarmed upper margin is granulated, and on the meropodites of the three first pairs the granules extend almost to the middle of the outer surface, but those of the last pair are nearly smooth; the lower margin is also finely granulated. The two following joints are less strongly compressed than those of *Tymp. pusillus* and are smooth, though somewhat punctate; finally, the terminal joints, which are compressed laterally, are a little shorter than the propodites.

Eggs very numerous, small, globular, 0.28—0.3 mm. broad.

Upper surface of the carapace dark blue, chelipedes and legs

marbled with partly reticulate, darker lines on a pale, olivaceous ground-colour; fingers ochraceous towards the tip. Ischium and posterior part of the merus of the outer foot-jaws and adjacent parts of the pterygostomian region whitish. Sternum and abdomen mottled with very small, dark points.

*Measurements in millimetres.*

	♂	♂	Ovigerous ♀	
Distance between the outer orbital angles	.. 7.7	7.2	6.2	5.75
Greatest breadth of carapace	.. 9	8.4	7	6.5
Length of carapace, without epistome	.. 6.4	6	5.1	5
Length of the chelipedes	.. 13	12.5	5.75	6.25
Length of the antepenultimate legs	15	14.5	9	9.5

3. *Pachygrapsus propinquus*, sp. nov.

(Plate xviii, fig. 2.)

A young male and a somewhat larger, sterile female from brackish water pools at Port Canning, Lower Bengal.

Carapace quadrangular, the distance between the outer orbital angles being one-third greater than the length. Upper surface depressed, very slightly arched transversely and longitudinally. Cervical groove quite distinct, interrupted at either side of the transverse median part, which is a little arcuate and placed immediately behind the middle. For the rest the regions are not defined, except the posterior cardiac area, which is indistinctly separated by shallow grooves from the branchial regions. Lateral margins of the carapace moderately convergent posteriorly, slightly concave in the middle, *with no tooth or spine* behind the acute outer orbital angles, that are directed outward. Branchial regions with eight or nine oblique, linear ridges, that barely extend on to the horizontal part of the upper surface; there is but a single transverse ridge on the hepatic regions, about midway between the orbits and the lateral parts of the cervical groove.

Front little more than half as broad as the distance between the outer orbital angles; it is strongly deflexed, though it is still partly visible when the carapace is looked at from above. Frontal lobes *four* in number, rounded, little prominent; lateral lobes a little broader than the internal ones; lower margin of the front very slightly concave in the middle, as in *Pach. minutus*. Anterior half of the gastric region and frontal lobes with numerous, transverse markings that are continued on to the front; the rest of the upper surface perfectly smooth. Posterior margin of the carapace about three-fourths the breadth of the front.

Orbits moderately oblique, eye-peduncles nearly smooth. Lower margin of the orbits sharp; opposite the basal part of the eye-peduncle, between its base and the cornea, the infraorbital

margin is divided into three or four small obtuse teeth and the arcuate, inner part appears somewhat uneven; the outer part of the margin carries a small, rounded notch not far from the outer orbital angle, and appears for the rest entire. Between the crenulate anterior margin of the buccal cavity and the arcuate, inner part of the infraorbital margin one observes a small, obtuse, dentiform lobe, at some distance from the anterolateral angle of the buccal cavity; in *Pach. minutus* this lobe is broader, transverse, almost contiguous to the antero-lateral angle of the buccal cavity and nearly in a line with the anterior margin of the latter. Subhepatic and subbranchial regions smooth, though pubescent. Lobe or tooth near the arcuate, inner part of the orbital margin triangular, subacute, separated by a rather broad hiatus from the front.

External maxillipeds (fig. 2a) as in *Pach. minutus*, a male specimen of which from the Bay of Batavia is lying before me; inner margin of the ischium straight (in *Pach. laevis*, Borr., concave), merus slightly broader than long, little shorter than the ischium, its inner angle obtuse, less produced than in *Pach. laevis*. Terminal segment (fig. 2b) of the male abdomen obtuse, almost as long as broad at base and distinctly longer than the penultimate segment; sternum and abdomen smooth.

Outer and inner sides of the merus of the right chelipede (the left is wanting in both specimens) furnished with transverse, squamiform, pubescent ridges, lower margin denticulate and with a sharp spine at the far end; anterior margin with a large, acute spine distally, followed on the distal margin by two smaller ones and preceded by three or four very small, acute teeth. Upper surface of the carpus with transverse and oblique ridges and with a small acute spine at the inner angle. Chela (fig. 2c) less convex than in *Pach. minutus*, upper margin of the palm with finely granular, oblique ridges, outer surface very finely granular, the granules only visible through a lens; a strong longitudinal ridge runs from near the tip of the immobile finger until near the carpal articulation; lower side of the palm with oblique markings and ridges. Fingers a little shorter than the palm, dactylus granular above and at its base, outer side of the fingers and lower margin of the index smooth; tips of the fingers spoon-like, glabrous.

Ambulatory legs (fig. 2) slenderer than those of *Pach. minutus*. Meri with transverse ridges on their outer surface and with an acute tooth above; the meri of the first pair are armed with two strong spines at the far end of their lower margin, those of the two middle legs with three and those of the last pair also with two, but on the three posterior legs these teeth are smaller than the two spines with which the lower margin of the meri of the 1st pair is armed. The three last joints are bristly and the dactyli, which are slightly curved at the acuminate tips, are but little shorter than the propodites.

*Pachygrapsus laevis*, Borr., from Funafuti (*Proc. Zool. Soc.*, 1900, p. 592, pl. xlii, fig. 7) is no doubt different. Of the single female on which this species was founded, the distance between the

outer orbital angles should be 7.5 mm., the length 6 mm., but the abdomen is apparently included, for, according to the figure, the length appears to be 5 mm., so that in this species the carapace is broader in proportion to its length, being just once and a half as broad as long. The frontal lobes are *seven* in number, the front is broader and the external maxillipeds are also different.

*Pachygrapsus longipes*, Rathb. (*Proc. National Museum*, xvi, 1893, p. 247, and *Bull. U. S. Fish Commission* for 1903, Wash., 1906, p. 840, pl. viii, fig. 7), from Honolulu, appears to resemble very much *Pach. planifrons*, de Man, from the Bay of Batavia (*Archiv. f. Naturg.*, bd. 53, 1888, p. 368, pl. xvi, fig. 2), but it is quite remarkable that neither Miss Rathbun nor Dr. Borradaile make mention of this species.<sup>1</sup> Unfortunately Miss Rathbun does not say whether, in *Pach. longipes*, the front is deflexed or not, but in the figure, published in 1906, the front resembles that of *Pach. planifrons*. According to this figure the propodal joints of the ambulatory legs should be *slenderer* than those of our species from Port Canning, so, e.g., the propodites of the penultimate pair appear, in that figure, four times as long as broad; in the larger specimen of *Pach. propinquus*, however, these joints are *three times as long as broad*, viz., 5 mm. long (measured along their posterior margin) and 1.6 mm. broad. I therefore suppose this Hawaiian form to be distinct from the species of the brackish pools at Port Canning. The slate-coloured upper surface of the carapace, and the red-brown legs are mottled with small dark spots. Measurements of the two specimens in millimetres—

Distance between the outer orbital angles ..	10.7	8.3
Length of carapace .. .. .	8	6.25
Breadth of front .. .. .	5.8	4.4
Breadth of posterior margin of carapace ..	4.5	3.5

#### 4. *Varuna litterata* (Fabr.), M. Edw.

*Varuna litterata* (Fabr.), M. Edw., Alcock, *l.c.*, No. 6, 1900, p. 401.

Port Canning, brackish water pools, January 28—30, 1906, collected by Dr. N. Annandale, four males, two females (Reg. No.  $\frac{5115}{10}$ ; Nov. 12, 1906, nine males, three females).

Backergunge, seven males, nine females, collected by H. E. Stapleton (Reg. No.  $\frac{5138}{10}$ ).

Dhappa, near Calcutta, slightly brackish water, twenty-eight males, two females.

All the specimens are young, the largest being a female from

<sup>1</sup> I wish to call attention to the fact that in vol. xxv of the *Zoological Record* for 1888 my paper on the Crustacea collected by Dr. Brock (*Archiv. f. Naturg.*, bd. 53, 1888) was mentioned in the List of Publications but not in the Systematic Part. The *Zoological Record* should not have been entrusted to such regardless authors.

Port Canning, the carapace of which is 23 mm. long. The anterior margin of the front is straight or very slightly concave. The specimens gathered at Dhappa are the youngest of all, the carapace of the smallest being hardly 4 mm. long.

5. *Metaplex dentipes* (Heller).

*Helice dentipes*, Heller, *Crustaceen der Novara-Reise*, 1865, p. 62, pl. v, fig. 5.

*Metaplex dentipes*, de Man, in *Journal Linnean Soc.*, xxii, 1888, p. 162, pl. xi, figs. 1—3; Alcock, *l.c.*, 1899, p. 433.

A male and a female, both adult, from brackish water pools at Port Canning.

The carapace of the male is 27·5 mm. broad and 20 mm. long, the epistome excluded. The infraorbital ridge consists of 23 lobules, that are quite typical. The penultimate segment of the abdomen is 3·5 mm. long, its anterior margin is 3·25 mm. broad, the posterior 5 mm., whereas the antepenultimate joint is 3 mm. long and the terminal joint as much.

The musical crest does not reach to the middle of the anterior margin of the arm and does not extend as far as the ischium; in a younger male from the Mergui Archipelago, lying before me, the crest is placed on the middle third of the anterior margin, conformably with my description of 1888; in this male the carapace is 19 mm. broad and 13·5 mm. long. The chelipedes of this male from Port Canning are equal, the chelæ are 26 mm. long, the palm 16·5 mm. long and 10·5 mm. high; the length of the palm is in proportion to its height as 13 : 8·3, according to my paper of 1888 this proportion should be 13 : 9½ for *Met. dentipes* and 13 : 8 for *Met. distinctus*, H. M. Edw. The chelæ closely resemble, indeed, those of the latter species (de Man, *l.c.*, pl. 10, fig. 9), as regards their shape and the serrations of the fingers.

The carapace of the female is 22 mm. broad and 16·5 mm. long, the infraorbital ridge consists of 23 lobules and hardly reaches beyond the lower margin of the orbits. The chelipedes are equal, 21 mm. long, almost as long as the carapace is broad; the two lower margins of the arm are finely denticulate, the outer surface granular, the upper margin hairy. Upper surface of the wrist minutely granular; chelæ 10 mm. long, about three times as long as high, fingers a little longer than the palm, the outer surface of which is minutely granular. In my work on the Crustacea collected by Capt. Storm I have pointed out that the ambulatory legs of *Met. elegans*, de M., are *slenderer* in the male than in the female (*Zoolog. Jahrb.* (Spengel), viii, Abth. f. Syst. 1895, p. 596); the same difference is presented by the male and female of *Met. dentipes*, the ambulatory legs being *much slenderer* in the male than in the female. So, *e.g.*, are the legs of the penultimate pair of the male 56 mm. long, those of the female 41 mm., about twice as long as the carapace is broad; the meropodites of these legs are, in the male, 20 mm. long and 5·3 mm. broad; in the female, however, 14·5 mm. long

and 5.5 mm. broad, appearing, in the latter, *considerably broader* than in the male ; the following joints are also slenderer in the male. The upper margin of the meropodites of the four ambulatory legs is armed, in the female, with an acute tooth near the distal end and this tooth is preceded, on the antepenultimate and penultimate pairs, by nine or ten smaller teeth that gradually become smaller. In the adult male the subdistal tooth is present on the meropodites of the four legs, but it is comparatively smaller than in the female, and the teeth that precede it, on the antepenultimate and penultimate pairs, are quite rudimentary, hardly recognizable. The ambulatory legs of the male are everywhere tomentose, in the female the mero- and carpopodites are nearly glabrous.

Geographical distribution : Ceylon (Heller), Mergui Archipelago (de Man), banks of the Hooghly, the mud-flats of Arakan, Tenasserim, and Mergui (Alcock).

#### 6. *Leander*, sp.

(Plate xviii, fig. 3.)

Seventy specimens from Dhappa, near Calcutta, collected in slightly brackish water.

These specimens are all young, the largest are 23 or 24 mm. long from tip of rostrum to end of telson, but the majority are still younger and of different size. They belong to the group of *L. styliiferus*, M. Edw. = *longirostris*, H. M. Edw. (*Hist. Nat. Crust.*, ii, p. 394), *L. tenuipes*, Hend., *L. japonicus*, Ortm., *L. carinatus*, Ortm., *L. hastatus*, Auriv., etc., but they show differences from all these species. I suppose, however, that these differences are *juvenile* characters and I therefore do not wish to describe these specimens as a new species, for probably they will later prove to belong either to *L. styliiferus* or to *L. tenuipes*, the former of which inhabits an estuary of the Ganges, the Sunderbunds, Mergui, the Gulf of Martaban and Karachi, while the second has also been observed in the Gulf of Martaban, at Madras and at Bombay.

The rostrum, the distal half of which is upturned, exceeds the antennal scales by one-third or one-fourth of its length, but in the youngest individuals it hardly reaches beyond them. The basal crest, which reaches to the end of the first joint of the antennular peduncle or to the middle of the second, is usually armed with six, more rarely with seven or five teeth ; these teeth are equidistant or the first is a little farther distant from the second than the following from each other, and the first tooth is situated just above the orbital margin or, just behind it, on the carapace. There is but one apical tooth ; only in one specimen was a trace of a second observed by means of the microscope ; the lower margin carries usually five, more rarely six or four teeth ; in the youngest specimens there are often only three.

Branchiostegal spine a little larger than the antennal spine. Abdominal segments *not* carinate ; in one of the largest specimens, the carapace of which is 9 mm. long, the rostrum included, and 3.9

mm. without it, the sixth segment of the abdomen is 2.4 mm. long, almost two-thirds the length of the carapace without the rostrum. The telson (fig. 3), distinctly longer than the sixth segment, reaches almost to the level of the spine on the outer margin of the exopodite of the caudal fin; the strongly tapering telson terminates in a slender, acute, median point or spine, the short, subterminal, outer spinules hardly reach to the middle of the median spine, but the inner spinules are almost twice as long as the median point. The two pairs of spinules on the upper surface are situated on its posterior half.

The shortest of the three antennular flagella extends by one-third of its length beyond the antennal scales. The spine at the outer margin of the antennal scales, is placed near the obtuse, oblique tip of the blade; the distance between the extremity of the blade and the tip of the spine measures only  $\frac{1}{11} - \frac{1}{10}$  the length of the outer margin of the scale.

The legs of the first pair are slightly shorter than the antennal scales; carpus and merus are of equal length and one-fifth or one-sixth longer than the chela (fig. 3a), which is four times as long as broad, and the fingers of which are a little longer than the palm. In one of the largest specimens the merus of first legs is 1.4 mm. long, the carpus 1.45 mm.; the chela is 1.2 mm. long and 0.29 mm. broad.

The legs of the second pair are equal and extend with the fingers beyond the antennal scales (fig. 3b). Merus a little broader, but *slightly shorter* than the ischium, together as long as the chela. The carpus, which gradually thickens distally, measures two-thirds the length of the ischium and appears also distinctly *shorter* than the merus; its thickness at the distal end is about one-fourth its length. The chela much resembles that of *L. tenuipes*, Hend. (Henderson, "A Contribution to Indian Carcinology," 1893, pl. 40, fig. 14). The chela appears, in the largest specimens, just as long as the carapace without the rostrum; the palm, which is somewhat inflated, is very slightly longer, but much thicker than the carpus, whereas the elongate, slender fingers are *once and two-thirds* as long as the palm; the fingers have sharp cutting edges, but no teeth, and their apices are strongly curved inward; the palm appears in the middle once and a half as thick as the distal end of the carpus. The whole leg seems to be smooth. In one of the largest specimens ischium, merus, carpus, palm and fingers are respectively 2.04 mm., 1.75 mm., 1.36 mm., 1.46 mm. and 2.4 mm. long; in a younger specimen, about 17 mm. long, these numbers are, in the same order, 1.6 mm., 1.4 mm., 1.02 mm., 1.02 mm., and 1.74 mm., the palm appearing here just as long as the carpus.

The three other legs are very slender and in the largest specimens reach slightly beyond the antennal scales. The measurements of a leg of the fifth pair (fig. 3c) of a specimen 18 mm. long are as follows: merus 1.86 mm. long and 0.14 mm. broad, 13 times as long as broad; carpus 0.85 mm. long, propodus 2 mm. long and 0.1 mm. broad in the middle, 20 times as long as broad; dactylus 0.85 mm. long, 0.1 mm. broad near the propodal articulation,

and regularly tapering to the acuminate point which is slightly curved inward.

The adult *L. styliferus*, H. M. Edw., differs according to Henderson's description (*l.c.*, p. 439) by the following: There are often two or three apical teeth on the rostrum, the lower margin of which is armed with 7—10 teeth. The last four abdominal segments are dorsally more or less carinated. The distal spine on the outer margin of the antennal scale is placed farther distant from the apex, the distance equalling nearly one-third of the total length of the outer margin. The palm of the chelæ of the second legs should be sulcate on its outer side, the sulcus bounded by two ridges.

The adult *L. tenuipes*, Hend., differs at first sight by the merus of the second legs that has twice the length of the ischium and that has an ill-defined sulcus on its upper surface. The apex of the telson is described as blunt, but may perhaps have been worn off as is often the case. The shortest of the antennular flagella does not reach the end of the antennal scales.

7. *Palæmon (Eupalæmon) lamarrei*, H. M. Edw.

(Plate xix, fig. 4.)

*Palæmon lamarrei*, H. Milne Edwards, *Hist. Nat. Crustacés*, ii, 1837, p. 397.

Nec: *Palæmon lamarrei*, de Haan, *Fauna Japonica*, Crustacea, p. 171.

Nec: *Palæmon lamarrei*, Ortmann, in *Zool. Jahrb.*, v, Abth. f. Syst. 1890, p. 701, taf. xlvii, fig. 2.

Twenty-five specimens from brackish water pools at Port Canning, Lower Bengal, collected by Dr. N. Annandale, 28—30th January, 1906.

Thirty-nine specimens from Calcutta (Museum tank, fresh water), collected 19th December, 1906.

These specimens, though very numerous, are all young, the largest specimen from Port Canning being 38.5 mm. long from tip of rostrum to end of telson; the largest individual from Calcutta is 30.5 mm. long, the rest are all of a smaller size. The fact that no adult specimens have been gathered is so much the more to be regretted, because they apparently belong to *Pal. lamarrei*, M. Edw., a species which since its first description does no more appear in literature or has been misunderstood.

I have already pointed out ("Notes from the Leyden Museum," i, 1879, p. 166) that a species described by de Haan as *Pal. lamarrei* was identical with *Pal. amazonicus*, Heller, from South America, but the existence of this species in Japan has not been confirmed as far as I am aware.

Without any ground Dr. Ortmann (*l.c.*) declared the localities mentioned by Milne Edwards and by de Haan as false, and, therefore, described Heller's species under the name of *Pal. lamarrei*.



Henderson ("A Contribution to Indian Carcinology," 1893, p. 442) regards *Pal. lamarrei* as being merely the young of *Pal. carcinus* (Fabr.), and by Lanchester *Pal. lamarrei* is regarded as a variety of *Pal. carcinus* ("Annals and Mag. Nat. History," ser. 7, vol. vi, 1900, p. 263 and "Proc. Zool. Soc." London, 1901, p. 565).

The rostrum, that exceeds the antennal scales in the largest specimen by one-third, in the younger individuals by one-fourth of its length, whereas in the youngest specimens it barely reaches beyond them, is upturned distally and presents, as regards its toothing, a great variation. In 21 specimens from Port Canning the following toothing was observed :—

$\frac{7+1+2}{9}$ , one specimen.	$\frac{5+1+1}{8}$ , one specimen.	$\frac{5+1+2}{7}$ , one specimen.
$\frac{6+1+1}{9}$ , " "	$\frac{7+2}{7}$ , " "	$\frac{5+2}{7}$ , " "
$\frac{7+2}{8}$ , " "	$\frac{7+1+1}{7}$ , " "	$\frac{5+1}{7}$ , " "
$\frac{7+1+1}{8}$ , " "	$\frac{7+1}{7}$ , " "	$\frac{7+2}{6}$ , " "
$\frac{7+1}{8}$ , " "	$\frac{6+2}{2}$ , three specimens.	$\frac{6+1}{6}$ , " "
$\frac{6+2}{8}$ , two specimens.	$\frac{6+1}{7}$ , one specimen.	$\frac{5+2}{6}$ , " "

In 35 specimens from Calcutta the toothing was as follows :—

$\frac{8+2}{9}$ , one specimen.	$\frac{7+1}{8}$ , one specimen.	$\frac{6+2}{7}$ , three specimens.
$\frac{8+1}{9}$ , " "	$\frac{7+?}{8}$ , two specimens, in which the tip is broken.	$\frac{6+1+1}{7}$ , one specimen.
$\frac{7+1}{9}$ , " "	$\frac{6+2}{8}$ , one specimen.	$\frac{6+1}{7}$ , three specimens.
$\frac{9+2}{8}$ , " "	$\frac{6+1}{8}$ , " "	$\frac{8+1+1}{6}$ , one specimen.
$\frac{8+2}{8}$ , " "	$\frac{8+1+2}{7}$ , " "	$\frac{8+2}{6}$ , " "
$\frac{8+1}{8}$ , " "	$\frac{7+1+?}{7}$ , one specimen, in which the tip is broken.	$\frac{8+1}{6}$ , " "
$\frac{7+1+1}{8}$ , " "	$\frac{7+2}{7}$ , three specimens.	$\frac{7+2}{6}$ , " "
$\frac{7+2}{8}$ , three specimens.	$\frac{7+1}{7}$ , " "	$\frac{7+1}{6}$ , " "

These numbers prove that there are proximally in most cases 7 or 6, more rarely 8 and exceptionally 9 or 5 upper teeth, that

specimens with one apical tooth are as numerous as those the rostrum of which carries two apical teeth, and that the lower margin usually is armed with 7 or 8, rarely with 6 or 9 teeth. According to Milne Edwards the rostrum should carry 6 or 7 upper teeth proximally and as many on the lower margin, but it is remarkable that he makes no mention at all of the apical tooth or teeth. Generally the *two* first teeth are placed on the carapace, only in two specimens from Calcutta one tooth is placed on the carapace, and in a single specimen from the same locality the three first teeth are placed upon it. The apical tooth or teeth, which are much smaller than those on the proximal part of the upper margin, are usually separated from the latter by a long smooth interspace, which is as long as the distance between the foremost proximal tooth and the anterior margin of the carapace, rarely somewhat shorter than that distance; rarely, *i.e.*, in 11 out of 56 specimens, the foremost proximal tooth is placed on the smooth interspace, about midway between the preceding and the apical teeth. In the largest specimen from Port Canning (fig. 4), the rostrum of which presents the toothing formula  $\frac{5+1+2}{7}$ , the foremost proximal tooth of the

upper margin is placed just above the first of the lower, immediately in front of the distal end of the first joint of the antennular peduncle; in other individuals the foremost proximal tooth is situated more or less in front of the first tooth of the lower margin; the proximal teeth of the upper as well as those of the lower margin are equidistant, and the former are larger than the latter. The rostrum is moderately broadened at the level of the first tooth of the lower margin and the latter appears a little concave at the base.

Several specimens of *Pal. carcinus* from the Kutei river, Borneo (Siboga Expedition), lie before me, amongst which are several young ones, the youngest specimen being nearly 70 mm. long, rostrum included. The rostrum of *Pal. carcinus* is narrower, less broadened than in *Pal. lamarrei*, it reaches farther beyond the antennal scales and the toothing is different; of the twelve or thirteen teeth of the upper margin the *three* first are placed on the carapace, and there is *no long smooth interspace* as in *Pal. lamarrei*, though the three or four teeth on the upturned part of the rostrum are farther distant from each other than the proximal teeth; the lower margin, finally, presents also a larger number of teeth, eleven or twelve, which reach to near the tip.

The sixth segment of the abdomen (plate xix, fig. 5) is *comparatively longer and broader* in *Pal. lamarrei* than in *Pal. carcinus*. In the specimen of the latter species, which is 70 mm. in length, the carapace, rostrum excluded, being 12 mm. long, the sixth segment is 5.5 mm. long and 4.3 mm. broad in the middle; in the largest specimen of *Pal. lamarrei*, which has a length of 38.5 mm., the carapace of which, without the rostrum, being 6.8 mm. long, the sixth segment of the abdomen is 3.9 mm. long and 2.4 mm. broad.

The slender telson (fig. 4d) apparently tapers less strongly than that of *Pal. carcinus* (fig. 5a), but it reaches almost to the

end of the endopodite of the caudal fin; this is not the case in *Pal. carcinus*; the telson ends in an acute point which reaches beyond the short, outer pair of subterminal spinules, whereas the long, inner pair extends far beyond the median spine. The telson is somewhat flattened on its posterior half, and the two pairs of spinules on the upper surface are placed as in *Pal. carcinus*; in the largest specimen from Port Canning there are three spinules on the left side and two on the right.

The shortest antennular flagellum which, as in *Pal. carcinus*, is united with the outer for a very short distance, exceeds the antennal scales by two-thirds of its length; free end of the antennal scales obtuse, reaching far beyond the outer spine. The third or distal joint of the mandibular palp is once and a half as long as the second; the third joint carries five setæ, two of which at the distal end are a little longer than the joint itself. External maxillipeds as in *Pal. carcinus*, extending with half their terminal joint beyond the tip of the antennal peduncle.

The first pair of legs reach to the spine at the far end of the outer margin of the antennal scales. The slender carpus, which is somewhat thickened distally, is one-fourth longer than the merus, which is nine times as long as broad and broader than the carpus; the chela is almost half as long as the carpus, its length being to that of the carpus as 4 : 9; the fingers are one-fourth longer than the palm. In the largest specimen from Port Canning the merus is 2.75 mm. long and 0.3 mm. broad; the carpus is 3.4 mm. long, the chela 1.52 mm., the palm 0.68 mm., the fingers 0.84 mm.; in a specimen from Calcutta which is 29 mm. in length, the merus is 2.3 mm. long and 0.23 mm. broad, just ten times as long as broad; the carpus 2.7 mm. long, the chela 1.26 mm., the palm 0.62 mm., the fingers 0.64 mm.

The second legs (fig. 4e) project with one-fourth of their propodites beyond the antennal scales and are twice as long as the carapace, rostrum excluded. The merus measures one-fourth the whole leg and is eleven times as long as broad; the carpus, which has a slenderer shape, and which thickens at the distal end, is just *once and a half* as long as the merus, *almost twice as long as the chela and three times as long as the palm*. The palm (fig. 4f) is a little longer than the fingers; it is a little broader than the distal extremity of the carpus and once and a half as broad as thick, being slightly compressed. Of the largest specimen from Port Canning, the carapace of which is 6.75 mm. long without the rostrum, the merus is 3.35 mm. long and 0.3 mm. broad; the carpus is 5.1 mm. long, the chela 2.97 mm., the palm 1.6 mm. and the fingers 1.37 mm. In one of the largest specimens from Calcutta (carapace 4.8 mm. long without the rostrum) the merus is 2.75 mm. long and 0.2 mm. broad, the carpus 3.9 mm. long, the chela 2.26 mm., the palm 1.15 mm., the fingers 1.11 mm.; in a younger specimen from Calcutta (carapace 3.7 mm. long without the rostrum) the merus is 1.9 mm. long and 0.16 mm. broad, the carpus 2.75 mm. long, the chela 1.65 mm., the palm 0.84 mm., the fingers 0.81 mm.

The following legs are slender, those of the fifth pair extend with their dactyli beyond the antennal scales. In a young specimen from Calcutta, which is 24 mm. in length, the legs of the fifth pair show the following measurements : merus 2.66 mm. long and 17 times as long as broad, carpus 1.4 mm. long, propodus 3 mm. long and 0.11 mm. broad in the middle, dactylus 1 mm. long and just as broad at the articulation as the preceding joint in the middle. The propodite, much slenderer than the merus and thickening towards the distal extremity, is just three times as long as the dactylus, which is very slightly curved towards the extremity.

*Pal. amazonicus*, Heller, with which *Pal. ensiculus*, Smith, and *Pal. jelskii*, Miers, are regarded as identical by Dr. Ortmann, is no doubt a different species. Three specimens of de Haan's *Pal. dieperinkii* from Surinam (Leyden Museum), a species identical with *Pal. amazonicus* (de Man, "Notes, Leyden Museum," i, 1879, p. 167) are lying before me. In this species the telson tapers to a pointed extremity, whereas the lateral spinules do not reach the tip ; the two pairs of spinules on the upper surface are situated more forward, the anterior pair being farther distant from the tip of the telson than from its base. The rostrum is higher at its base, though in this species also the two first teeth are on the carapace. Unfortunately the three specimens are adult, the carapace of the youngest, without the rostrum, being 21 mm. long, so that I am unable to compare the legs, the measurements of which show other proportions than in very young specimens.

As regards *Pal. carcinus*, I wish to observe that in the youngest specimen from the Kutei river the carpus (6.75 mm.) of the second legs is but *little longer* than the merus (5.5 mm.), *slightly shorter* than the chela (7.25 mm.) and only once and a half as long as the palm (4.25 mm.).

Geographical distribution : Coast of Bengal (H. M. Edw.).

#### 8. *Palæmon*, sp.

Two specimens from Dhappa, near Calcutta, slightly brackish water.

The two specimens are of equal size, 17—18 mm. long from tip of rostrum to end of telson ; they are apparently very young and the legs, especially those of the first and second pairs, are wanting, so that I am unable to identify them with any known form.

The lanceolate rostrum is straight and barely reaches beyond the antennal scales. In both specimens the rostrum is  $\frac{1.3}{4}$  dentate ; the two first teeth are placed on the carapace and are once and a half respectively almost twice as far distant from each other as the second from the third ; the following teeth are equidistant, but in one specimen the tenth tooth is farther remote from the eleventh, the distance between these two teeth being equal to the distance between the eleventh tooth and the tip, in the other the ninth and the tenth are farther distant than the preceding.

Body smooth. The telson tapers to a median point, far exceeded by the long, inner pair of subterminal spinules ; the anterior

pair of spinules on the upper surface is placed just in the middle of the telson.

Prof. Henderson ("A Contribution to Indian Carcinology," 1893) describes five species observed near Calcutta and in rivers of India, but all seem to be different. *Pal. altifrons* differs by a shorter and deeper rostrum, that of *Pal. dayanus* presents another toothings  $\frac{7-9}{5-6}$ ; in *Pal. scabriculus* the four to six first teeth are situated on the carapace, *Pal. dispar* is probably also different and this is, of course, also the case with *Pal. carcinus*.

#### 9. *Caridina*, sp.

Three specimens which seem to belong either to *Car. gracilirostris*, de M., or to *Car. gracillima*, Lanch., were gathered at Dhappa, near Calcutta, in slightly brackish water. Unfortunately, the rostrum is broken or incomplete at the tip and most of the legs are wanting, so that it proved to be impossible to determine them with certainty.

#### 10. *Caridina propinqua*, sp. nov.

(Plate xix, fig. 6.)

Five specimens of different size from Dhappa, near Calcutta, collected in slightly brackish water. This species is closely related to *Car. syriaca*, Bouv., from Syria, and still more to *Car. fossarum*, Heller, from Persia, but is perhaps different.

The largest specimen is 20.5 mm. long from tip of rostrum to tip of telson and all are devoid of eggs, so that these specimens are, therefore, probably young.

In the largest specimen the rostrum, which just reaches beyond the far end of the second joint of the antennular peduncles, projects at first straight forward to the middle and then turns slightly downward. The upper margin is armed with 21 rather small teeth that stand until near the tip; the three first teeth are placed on the carapace. On the slightly convex median part of the upper margin the teeth are placed nearer together (fig. 6); the penultimate tooth is a little farther distant from the antepenultimate than the preceding, and the foremost tooth is still slightly farther distant from the penultimate. The distance between the foremost tooth and the acute tip of the rostrum is only one-tenth the length of the rostrum proper, and not yet twice as long as the distance between the foremost tooth and the penultimate. The rostrum, 3.1 mm. long from the tip to the anterior margin of the carapace and 0.46 mm. broad, not yet seven times as long as broad, appears a little lower (less broad) than that of *Car. syriaca* (Bouvier, "Observations nouvelles sur les crevettes de la famille des Atyidés," 1905, p. 82, fig. 6). The lower margin carries a single tooth that is smaller than the teeth of the upper margin and placed at the anterior third of the rostrum; the anterior part of the lower margin between this

tooth and the tip, which appears slightly concave in *Car. syriaca*, appears in *Car. propinqua* straight and the rostrum is proximally less concave.

In another specimen nearly of the same size the rostrum of which is broken off, four teeth are placed on the carapace. In the third specimen, 19.5 mm. long, the rostrum is turned downward from the base and reaches to the end of the second joint of the antennular peduncle; the rostrum—2.5 mm. long from the tip to the anterior margin of the carapace and 0.4 mm. high (broad)—has the same form as in the first specimen. The upper margin carries 17 equidistant teeth, four of which are placed on the carapace; the foremost tooth is farther remote from the acute tip than in the preceding specimen, its distance from the tip is nearly one-sixth the length of the rostrum proper and as long as the space occupied by the four anterior teeth together. The lower margin carries two teeth on its anterior half; these teeth, smaller again than those of the upper margin, are situated just below the foremost and the penultimate tooth of the latter.

The fourth specimen is much younger, being 13.5 mm. long. The rostrum, little longer than the first joint, rises at first a little upward, but soon curves downward and has, therefore, another shape than in the preceding specimens. There are again 17 teeth on the upper margin, four of which are on the carapace; the distance between the foremost tooth and the tip measures one-seventh the length of the rostrum proper. The rostrum appears a little less broad (high) than in the preceding specimens, its height being only one-eighth of its length. There is but one small tooth on the lower margin, situated just below the penultimate tooth of the upper.

Unfortunately in the youngest specimen, 10 mm. long, the tip of the rostrum is broken off, the existing part reaches quite horizontally to the end of the first joint of the antennular peduncle and carries 16 teeth, five of which are on the carapace; the lower margin bears two teeth. The telson of the third specimen carries, on the posterior third of its upper surface, two pairs of spinules, the posterior spinule on the left side is wanting; the triangular tip carries at either side four or five spinules, the first of which, at the outer angles, is as usual the shortest, the second the longest, 0.3 mm. long, the third 0.24 mm. long, the fourth 0.16 mm. The telson (fig. 6a) of the second specimen carries at its posterior extremity at the right side six, at the left seven spinules (fig. 6b), the first small spine at the left angle being apparently supernumerary. The upper surface carries two pairs of spinules, but one spinule at the right side is wanting. The telson of the largest specimen carries three pairs of spinules above, the anterior pair placed somewhat nearer to the base than to the tip of the telson.

Antennular peduncle reaching to the middle of the distal spine of the antennal scales, shorter therefore than the latter. The first joint, *i.e.*, the distance between the anterior margin of the carapace and the far end of this joint, is slightly longer than the

two following joints taken together ; the second joint is little more than half as long as the first and about three times as long as broad ; the third joint measures three-fifths the length of the second. The acuminate stylocerite reaches, as in *Car. syriaca*, almost to the end of the first joint and diverges slightly outward ; the spine at the end of the outer margin of the first joint measures two-fifths the length of the second. External maxillipeds reaching to the end of the second joint of the antennular peduncle.

The legs of the first pair (fig. 6c) reach almost to the end of the antennal peduncle. The carpus, which is one-third longer than the merus, resembles that of *Car. lævis*, Heller, and is 2.5—2.7 times as long as broad distally ; its upper margin is slightly concave, the lower straight, and it is just half as thick proximally as distally. The chela, one-fourth longer than the carpus, is a little more than twice as long as broad, and the fingers are once and a half to twice as long as the palm.

The second legs (fig. 6d) reach to the middle of the antennal scales, projecting just beyond the antennal peduncles. The carpus, once and a half as long as the merus, is moderately slender and 4.5—5.5 times as long as thick distally. The chela (fig. 6e), shorter than the carpus, is nearly three times as long as broad, the proportion between length and breadth varying between 2.64 and 3.32 ; the fingers are a little more than once and a half to twice as long as the palm.

Merus of third legs nine times as long as broad and armed near its lower margin with four spines which are 0.21 mm. long ; the second spine is placed somewhat nearer to the proximal than to the distal extremity, the first just midway between the second and the proximal extremity, the third as far from the second as the second from the first, the fourth near the distal extremity. There is also a spine near the distal end of the carpus. The dactyli (fig. 6f) measure barely one-third the length of the propodites ; they carry five or six spines. In the third specimen, the rostrum of which is  $\frac{1}{2}$  toothed, the dactyli are five times as long as broad and armed with four spines, besides the terminal claw ; the third is separated by a long, smooth interspace from the penultimate spine, probably abnormally, for, in the two larger specimens, the five or six spines are arranged regularly as in other species.

The meropodites of the fourth legs are 8 times as long as broad and armed with four spines near their lower margin, the fourth being inserted near the distal end. The propodites, 13.6 times as long as broad, are 3.6 times as long as the dactyli, that are almost five times as long as broad ; the dactyli are armed with nine spines, the terminal claw included.

Unfortunately, only in one specimen, the third, a fifth leg is present, in the other specimens these legs are wanting. The meropodite, 1.4 mm. long, is 8 times as long as broad ; there is a spine 0.18 mm. long near the distal extremity of the lower margin. Propodite 1.76 mm. long, about 14 times as long as broad ; the dactylus, almost six times as long as broad, measures *two-fifths* the

length of the propodite and is armed with 48 spinules, the terminal claw included. *Caridina syriaca*, Bouv., is at once distinguished by the upper teeth of the rostrum, *none of which are placed on the carapace.*

When the descriptions of *Car. fossarum* (Heller, in "Sitzungsber. K. Akad. Wiss.," 1862, p. 411, and de Man, in Max Weber's "Zool. Ergebn. Reise Niederl. Ost-Indien," ii, 1892, p. 397) are compared, it becomes obvious that the Bengal species chiefly differs by the lower margin of the rostrum presenting only 1 or 2 teeth instead of 7—9. In the same paper (*l.c.*, p. 377) I have, however, pointed out that in *Car. laevis*, Heller, a closely related species from Java, the lower margin presents not only 3 teeth, as was described by Heller, but sometimes 4 to 9, 11 or 15, though also a specimen was observed from the same locality with 2 teeth and another in which the lower margin carried only one tooth! This great variation may also be proper to *Car. propinqua*, and in that case this species should perhaps prove to be identical with *Car. fossarum*: a further observation of specimens of the Bengal species appears therefore necessary. Several ovigerous females of *Car. laevis*, Heller, from the freshwater lake Situ Bagendit, Java (de Man, *l.c.*, p. 376) are lying before me. This species may easily be distinguished by the legs of the first and of the second pair. The carpus of the first legs closely resembles that of *Car. propinqua*, as it is also two and a half times as long as broad, but the fingers are a little shorter. The carpus (plate xix, fig. 7) of the second legs has a slenderer shape, being almost eight times as long as thick distally; the chief difference is, however, presented by the chela which has a *much slenderer form*, being 4—4·7 times as long as broad (fig. 7a); in *Car. propinqua* only about 3 times (fig. 6e).

As regards the other legs the two species closely agree as is proved by the measurements given below, and also by the following: The meropodites of the third pair are about 9 times as long as broad, there is a spine on the middle of the lower margin of the ischium and three on that of the meropodites; the second spine is inserted a little nearer to the distal than to the proximal extremity, the first just midway between the proximal extremity and the second spine, the third near the distal extremity; these spines are 0·2 mm. long. A similar spine occurs at the far end of the carpus. The propodites carry 16—18 spinules along their lower margin; the dactyli are in the same proportion to the propodites as in *Car. propinqua*, but they are armed with eight or nine spines.

The meropodites of the fifth pair are, in *Car. laevis*, just 8 times as long as broad and one-fourth shorter than those of the third; the ischium has no spine, but there is a spine near the middle of the lower margin of the meropodites and another not far from the distal extremity. There is also a spine at the far end of the carpus and three smaller spines between the former and the proximal extremity.

*Car. hova*, Nob., from Madagascar and *Car. opaensis*, Roux, from Celebes are also related species. In the Madagascar species



the tip of the rostrum is slightly directed upward. The third joint of the antennular peduncle is described as subequal to the second; the stylocerite reaches to the middle of the second joint. External maxillipeds projecting beyond the antennal scales. The carpus of first legs is more distinctly excavate and more regularly conical; the fingers are as long as or barely longer than the palm. The chela of the second legs is shorter in proportion to the carpus, the dactyli of the third pair measure one-fourth and those of the fifth barely one-fifth of the propodite, appearing much shorter than in *Car. propinqua* (Nobili, "Boll. Mus. Zool. Torino," xx, 1905, No. 499).

The rostrum of *Car. opaensis*, Roux, is also *turned upward* at the tip and carries three or four teeth on the lower margin. The carpus of the first legs is three times as long as thick distally and *the fingers are slightly shorter than the palm*; those of the second legs, as also the dactyli of the following, are shorter than those of *Car. propinqua* (Roux, "Décapodes d'eau douce de Célèbes, Genève," 1904, p. 547, figs. 8, 9 and 10).

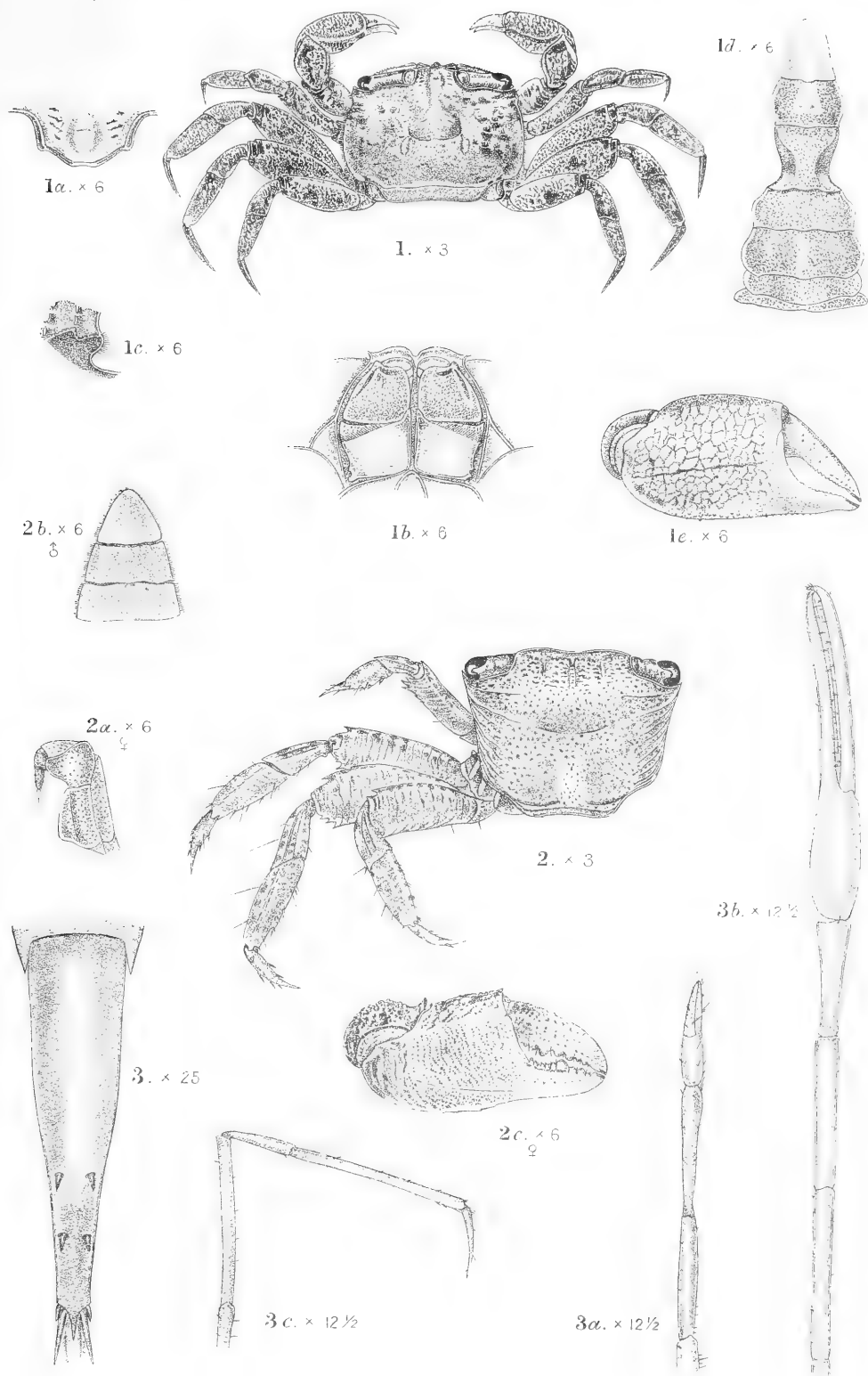
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## EXPLANATION OF PLATES XVIII AND XIX.

- FIG. 1.—*Tympanomerus stapletoni*, sp. nov., adult male,  $\times 3$  ;  
 1a front viewed from above ; 1b buccal frame and  
 external maxillipeds ; 1c lateral view of the antero-  
 lateral margin of the carapace ; 1d abdomen ; 1e outer  
 view of the chela ; figs. 1a--e all taken from the adult  
 male and all  $\times 6$ .
- „ 2.—*Pachygrapsus propinquus*, sp. nov., female,  $\times 3$  ; 2a external  
 maxilliped of this female,  $\times 6$  ; 2b three last segments  
 of the abdomen of the male,  $\times 6$  ; 2c chela and carpus  
 of the right chelipede of the female,  $\times 6$ .
- „ 3.—*Leander*, sp., telson,  $\times 25$  ; 3a, 3b and 3c legs of the first,  
 of the second and of the fifth pair, each  $\times 12\frac{1}{2}$ .
- „ 4.—*Palæmon (Eupalæmon) lamarrei*, H. M. Edw., carapace  
 and rostrum of the largest specimen from Port Can-  
 ning  $\times 3$  ; 4a extremity of the rostrum of this specimen  
 $\times 25$  ; 4b carapace and rostrum of a younger speci-  
 men from Calcutta,  $\times 3$  ; 4c lateral view of the sixth  
 abdominal somite and telson of the largest specimen  
 from Port Canning,  $\times 5$  ; 4d telson of a younger speci-  
 men from Calcutta,  $\times 10$  ; 4e leg of the second pair of  
 the largest specimen from Port Canning,  $\times 10$  (the  
 chela being placed somewhat obliquely) ; 4f chela of  
 this leg,  $\times 17$ .
- „ 5.—Sixth abdominal somite and telson of a young specimen,  
 long 70 mm. (rostrum included) of *Pal. (Eupalæmon)*  
*carcinus*, Fabr., from the river Kutei, Borneo  $\times 5$  ; 5a  
 telson of another young specimen, 75 mm. long, from  
 the same river,  $\times 5$ .
- „ 6.—*Caridina propinqua*, sp. nov., anterior part of carapace,  
 antennular and antennal peduncles,  $\times 12$  ; 6a telson,  
 $\times 12$  ; 6b extremity of telson,  $\times 50$  ; 6c leg of 1st pair,  
 $\times 25$  ; 6d leg of second pair,  $\times 17$  ; 6e chela of this leg,  
 $\times 25$  ; 6f dactylus of third leg,  $\times 50$  ; all the figures  
 are taken from the largest specimen, except figs.  
 6a and 6b which are from the specimen the rostrum  
 of which is broken off.
- „ 7.—*Caridina lævis*, Heller, from Java, leg of the second pair,  $\times$   
 17 ; 7a chela of this leg,  $\times 25$ .



J. G. de Man, del.

McFarlane & Erskine Lith Edin'

Fig1. TYMPANOMERUS STAPLETONI n.sp.  
Fig2. PACHYGRAPSUS PROPINQUUS n.sp. Fig3. LEANDER sp.



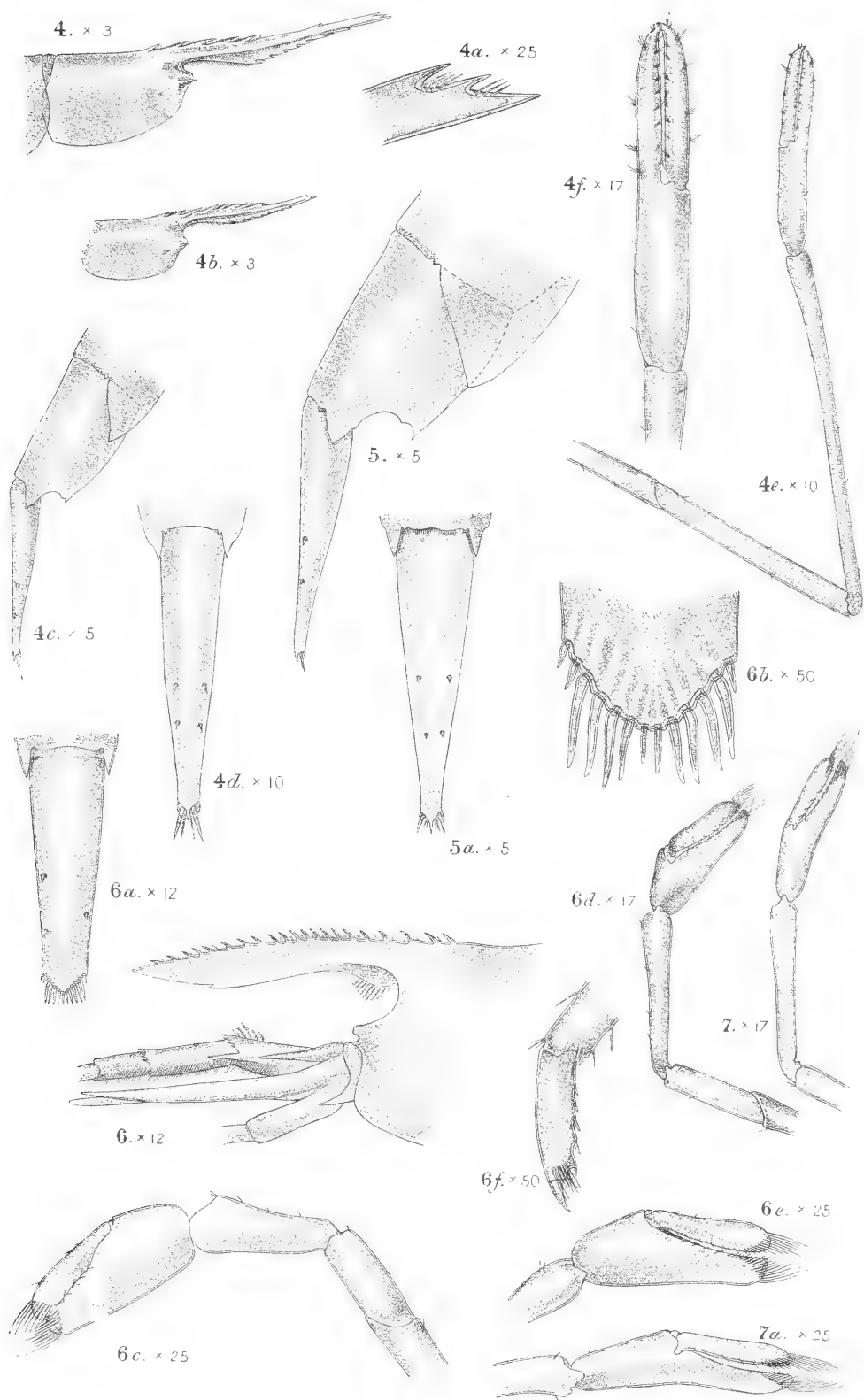


Fig 4. PALAEMON LAMARREI H.M. EDW  
Fig. 6. CARIDINA PROPINQUA n.sp.

Fig. 5. PALAEMON CARINUS Fabr  
Fig 7. CARIDINA LAEVIS Heller





## XXV. THE FAUNA OF BRACKISH PONDS AT PORT CANNING, LOWER BENGAL.

### PART XI.—TWO NEW MYSIDÆ FROM BRACKISH WATER IN THE GANGES DELTA.

By WALTER M. TATTERSALL, *M.Sc.*

I am indebted to the courtesy of Dr. J. G. de Man, to whom I wish to express my thanks, for the opportunity of examining and describing the two species of Mysidæ which form the subject of the present note. The material was collected in brackish water ponds near Calcutta by Dr. Nelson Annandale, who is making an exhaustive study of the lacustrine fauna of Bengal. The majority of the specimens belong to the interesting genus *Macropsis*, but appear to differ in some points from the widely distributed and hitherto only known species, *M. slabberi*, sufficiently to warrant the establishment of a second species of that genus. The second new form here described is represented by only nine specimens. It belongs to the little known and somewhat obscure genus *Potamomysis*, but after much hesitation, I have decided to institute a new species for its reception.

#### Sub-fam. MYSINÆ.

#### Genus POTAMOMYSIS, Czerniavsky.

*Potamomysis*, Czerniavsky, *Monog. Mysid. Imperii Rossici*, fasc. i, p. 129, 1882; fasc. iii, p. 78, 1883.

This genus was described by Czerniavsky in the monograph referred to above, and has not since, so far as I am aware, been met with. The type of the genus with its single species, *P. pengoi*, was a female, and I cannot gather from the text that Czerniavsky ever examined male specimens. Yet in the two keys to the genera of Mysidæ which he gives on pages 57 and 62 of the first part of his monograph, he places *Potamomysis* in that group of genera characterised by having the first, second and fifth pleopods of the male rudimentary as in the female, the third and fourth pairs somewhat dissimilar from those of the female, but not truly natatory.

If I am right in referring the present species to *Potamomysis*, the position assigned to this genus in Czerniavsky's keys is incorrect, since the third, as well as the first, second and fifth pleopods of

the male, appears to be simple and rudimentary as in the female, the genus thus agreeing in this respect with *Neomysis* and *Diamysis*. The species here dealt with is otherwise so closely in agreement with the general characters of *Potamomysis pengoi* that for the present I prefer to refer it to the same genus, which may therefore be diagnosed as follows:—

POTAMOMYSIS, Czerniavsky.

*Antennal scale* long and narrow, subulate, ciliated all round, two jointed.

*Thoracic legs* with the tarsus three to four jointed.

*Telson* short; apex entire, truncated, armed with numerous spines; lateral margins armed with short subequal spines along their entire length; no median apical setæ.

*Pleopods* of the male; the first, second, third and fifth pairs simple, uniramous and rudimentary as in the female; the fourth pair with a short peduncle and inner ramus as is usual in the subfamily *Mysinæ*, the outer ramus very long and slender, three jointed, the terminal joint bearing two long spiniform ciliated filaments and a single long smooth filament.

The genus is thus very closely allied to both *Neomysis* and *Diamysis*, but the form of the telson suffices to distinguish it from both, while male specimens are further distinguished by the form and armature of the fourth pair of pleopods.

*Potamomysis assimilis*, sp. nov.

(Plate xxi, figs. 1—8.)

*General form* (fig. 1) small, linear and compact.

*Carapace* (fig. 1) covering all the thoracic segments but the last; only slightly produced in front into a small obtuse rostral projection; antero-lateral corners apparently rounded.

*Pleon* (fig. 1) longer than the thorax; first five segments more or less subequal in length; sixth segment one-and-a-half times as long as the fifth.

*Antennular peduncle* (fig. 2) about half as long as the antennal scale; basal joint the longest; second joint small; third joint longer than the second and more robust, with a single plumose seta at the inner distal corner; a similar seta at the inner distal corner of the second joint, and at the outer distal corner of the third joint.

*Antennal peduncle* (fig. 3) less than half as long as the scale, with the terminal two joints subequal in length.

*Antennal scale* (fig. 3) equal in length to the last two segments of the pleon, long and narrow, subulate in shape, about seven times as long as broad, setose all round, two jointed, the second joint equal to between one fourth and one fifth of the entire length of the scale; spine on the outer corner of the basal joint well-developed and acute.

Eyes reaching to about the distal extremity of the basal joint of the antennular peduncle; rather stout; cornea occupying the entire distal part of the eye, pigment very black.

*Mouth parts* of the usual type in the *Mysinae*, with no outstanding feature of importance.

*Thoracic legs* (figs. 4, 5, 6); first and second without a distinct dactylus; third to eighth with the tarsus equal in length to the merus and three jointed in all but the eighth, where it is four jointed.

*Telson* (fig. 7) about two-thirds of the length of the last segment of the pleon, and rather longer than broad at its base; apex truncate and bounded at each corner by a long spine between which are about seventeen shorter spines; lateral margins armed throughout their length with about ten short spines.

*Inner uropod* about twice as long as the telson; no spines on the inner ventral margin.

*Outer uropod* about one-and-a-quarter times as long as the inner.

*Length* of an adult female with eggs in the broad lamellæ, 5 mm.; length of the largest male, apparently mature, 4 mm.

The above description and fig. 1, pl. xxi, are taken from an adult female, 5 mm. long. The figures of the various parts are from a male measuring 4 mm. in total length, and this difference in size probably accounts for the difference in armature of the telson as shown in fig. 7 and that given in the above description. A still smaller specimen, 3 mm. in length, had only seven spines on the apex of the telson between the two large lateral ones. Czerniavsky has shown similar differences between young and adult specimens of *P. pengoi*.

A male of 4 mm. appears, to judge by the fourth pleopods, to be mature if not fully grown. The fourth pleopod of such a male is shown in fig. 8. The basal joint is short and the inner ramus of the usual structure. The outer ramus is long and styli-form, reaching to the posterior end of the sixth segment of the pleon. It is three jointed, the second the shortest and the terminal joint the longest. The latter is furnished at its apex with two long, subequal ciliated filaments and on the outer distal margin with a single smooth filament, longer than the ciliated filaments at its apex. There is no prominent hirsute lobe on the antennules of the above male specimen, such as is usually met with in male *Mysidæ*. It is replaced by a tuft of long hairs proceeding from a small tubercle on the distal ventral edge of the antennular peduncle.

*Locality of capture*.—Dhappa, near Calcutta, slightly brackish water (canal), six females and three males.

This species differs from *P. pengoi* in the following points:—

- (1) *Size*.—The type-specimen of *P. pengoi* was an adult female measuring 10 mm. Adult females of the present species with eggs in the brood-pouch only measure 5 mm.

- (2) *Antennal scale*.—The second joint of the antennal scale of *P. pengoi* is described as small, and only about one ninth of the whole antennal scale in length. In *P. assimilis* the second joint of the scale is rather large and equal to between one fifth and one quarter of the length of the scale.
- (3) Czerniavsky describes in *P. pengoi* two secondary spines at the terminal part of the tarsus of the thoracic limbs in addition to the dactylus, giving the whole limb a tri-unguiculate appearance. No such secondary dactyli appear to be present in *P. assimilis* though, as shown in fig. 6, there are sundry setæ in the position shown by Czerniavsky for the secondary nails. It may be that Czerniavsky has mistaken the setæ for spines and this apparent difference between his species and the present one may not actually occur.

Otherwise the two species are in very close agreement and the occurrence in brackish water in India of a species of this obscure genus is of special interest.

Genus MACROPSIS, G. O. Sars.

*Macropsis orientalis*, sp. nov.

(Plate xxii, figs. 1—9.)

The differences between *M. orientalis* and the only other known species of this curious genus, *M. slabberi*, are mainly differences in the proportions which the various parts bear to one another.

These differences are most conveniently brought out in a table of comparative measurements of the two species, side by side. It will be best, therefore, to give such a table first and then to discuss the characters of the two species, one by one, in the light of the table.

The measurements of *M. slabberi* are taken from specimens from Saltash Bridge, near Plymouth, which I received through the courtesy of the Marine Biological Station at Plymouth.

The sum of the differences between the two species is that *M. orientalis* is a much more robust form, *M. slabberi*, on the other hand, being very slender and attenuated, with the various appendages correspondingly elongated.

Measurements.		<i>Macropsis slabberi.</i>		<i>Macropsis orientalis.</i>	
		Actual length in mm.	Percentage of length from rostrum to tip of telson.	Actual length in mm.	Percentage of length from rostrum to tip of telson.
1	Length of eye ..	.86	17.4	.52	9.2
2	Width " " at cornea ..	.24	4.8	.25	4.4
3	Length " cornea ..	.19	3.9	.17	3.0
4	" " antennular ped. ..	.92	18.6	.67	11.8
5	" " first joint ..	.52	10.5	.32	5.6
6	" " second joint ..	.19	3.9	.15	2.6
7	" " third " ..	.21	4.2	.20	3.5
8	" " antennal scale ..	.82	16.6	.92	16.3
9	" " carapace ..	1.50	30.3	1.90	33.6
10	" " exposed part of thorax.	.25	5.0	.44	7.8
11	" " 1st pleon segment	.30	6.0	.33	6.0
12	" " 2nd " " ..	.34	6.8	.36	6.4
13	" " 3rd " " ..	.39	7.9	.39	7.0
14	" " 4th " " ..	.43	8.7	.42	7.4
15	" " 5th " " ..	.45	9.1	.46	8.1
16	" " 6th " " ..	.79	16.0	.67	11.8
17	Width " 6th " " ..	.36	7.3	.45	8.0
18	Length " telson to base of terminal spine.	.37	7.5	.42	7.4
19	" " telson to tip of terminal spine.	.44	9.0	.47	8.3
20	" " telson to extreme apex.	.49	9.9	.68	12.0
21	" " inner uropod ..	.92	18.6	.94	16.6
22	" " outer " " ..	1.18	23.9	1.27	22.5
23	Total length—rostrum to tip of telson.	4.94	100.0	5.65	100.0

*Carapace.*—The carapace in *M. orientalis* is slightly longer proportionally than in *M. slabberi*, and correspondingly broader. The front part is more evenly rounded and consequently less produced in the former than in the latter species (fig. 1).

*Pleon.*—The measurements 11—16 in the above table of the segments of the pleon of the two species show that in *M. slabberi* the segments are proportionately more elongate than in *M. orientalis*. Especially is this so with the sixth segment which in the former species is one-and-three-quarter times as long as the fifth, while in *M. orientalis* it is less than one-and-a-half times that length. At the same time the measurement 17 shows that the sixth segment of the pleon is relatively narrower in *M. slabberi* than in *M. orientalis*, and that the rest of the body is correspondingly narrower in the former species.

*Eye*.—In *M. orientalis* the eye is only 9 per cent. of the total body-length, is very little more than twice as long as broad at the cornea, and the latter occupies the distal third of the whole eye. In *M. slabberi* the eye is 17 per cent. of the total body-length, is three-and-a-half times as long as broad, and the cornea occupies the distal two ninths of the whole eye. So that in *M. orientalis* the eye is on the whole very much shorter than in *M. slabberi*.

*The antennular peduncle* in *M. orientalis* is considerably shorter than in *M. slabberi*, being only 11.8 per cent. of the total body-length in the former compared with 18.6 per cent. in the latter. The shortening of the antennular peduncle in *M. orientalis* is proportional to that of the eye, so that in both species the eye bears the same relation to the antennular peduncle, *i.e.*, it extends to about the distal end of the second joint. The spine-like seta on the outer distal corner of the basal joint of the antennular peduncle is scarcely as robust in *M. orientalis* as in *M. slabberi*.

*The antennal scale* is of practically the same size in both species, with the result that, owing to the shortening up of the antennular peduncle in *M. orientalis*, the scale extends beyond the antennular peduncle, while in *M. slabberi* it falls short of it.

*Telson*.—The telson of *M. orientalis* (fig. 7) differs from that of *M. slabberi* mainly in having the serrated apical portion more produced and the whole telson consequently proportionally longer. The serrated apical portion of the telson in *M. slabberi* is only about one quarter of the entire length of the telson, whereas in *M. orientalis* it is considerably more than one third of that length.

In the structure of the various appendages the two species show considerable resemblance, but minor differences are to be noted. For this purpose I give, on pl. xxii, figures of the various appendages of *M. orientalis* for comparison with those of *M. slabberi*.

In the second thoracic limb of *M. orientalis* (fig. 5) the terminal joint is somewhat longer and narrower than in the same limb of *M. slabberi*. The number of joints in the tarsus of the third to the eighth thoracic limbs of *M. orientalis* varies from five to nine, the eighth limb usually having fewest joints in the tarsus. Thus in one female example dissected the joints of the tarsus were seven in the third, fourth and fifth limbs, eight in the sixth, nine in the seventh and only six in the eighth. Figure 6 depicts the eighth thoracic limb of a male with only five joints in the tarsus.

The fourth pleopod of the male of *M. orientalis* differs rather markedly from the same appendage in *M. slabberi*, in having the first joint of the outer ramus shorter than the entire inner ramus. In *M. slabberi* the reverse obtains. Otherwise the appendages in question are very similar.

I could not detect any spine on the inner ventral margin of the inner uropod of *M. orientalis* such as exists in *M. slabberi*.

*Length* of the largest specimens of *M. orientalis*, both males and females, 7 mm. from the rostrum to the apex of the telson.

*Locality of capture.*—Dhappa, near Calcutta, slightly brackish water, 270 specimens, 4—7 mm. long; Port Canning, Lower Bengal, brackish water ponds, 117 specimens, 4—7 mm. long.

*M. orientalis* is apparently an abundant species in suitable localities.



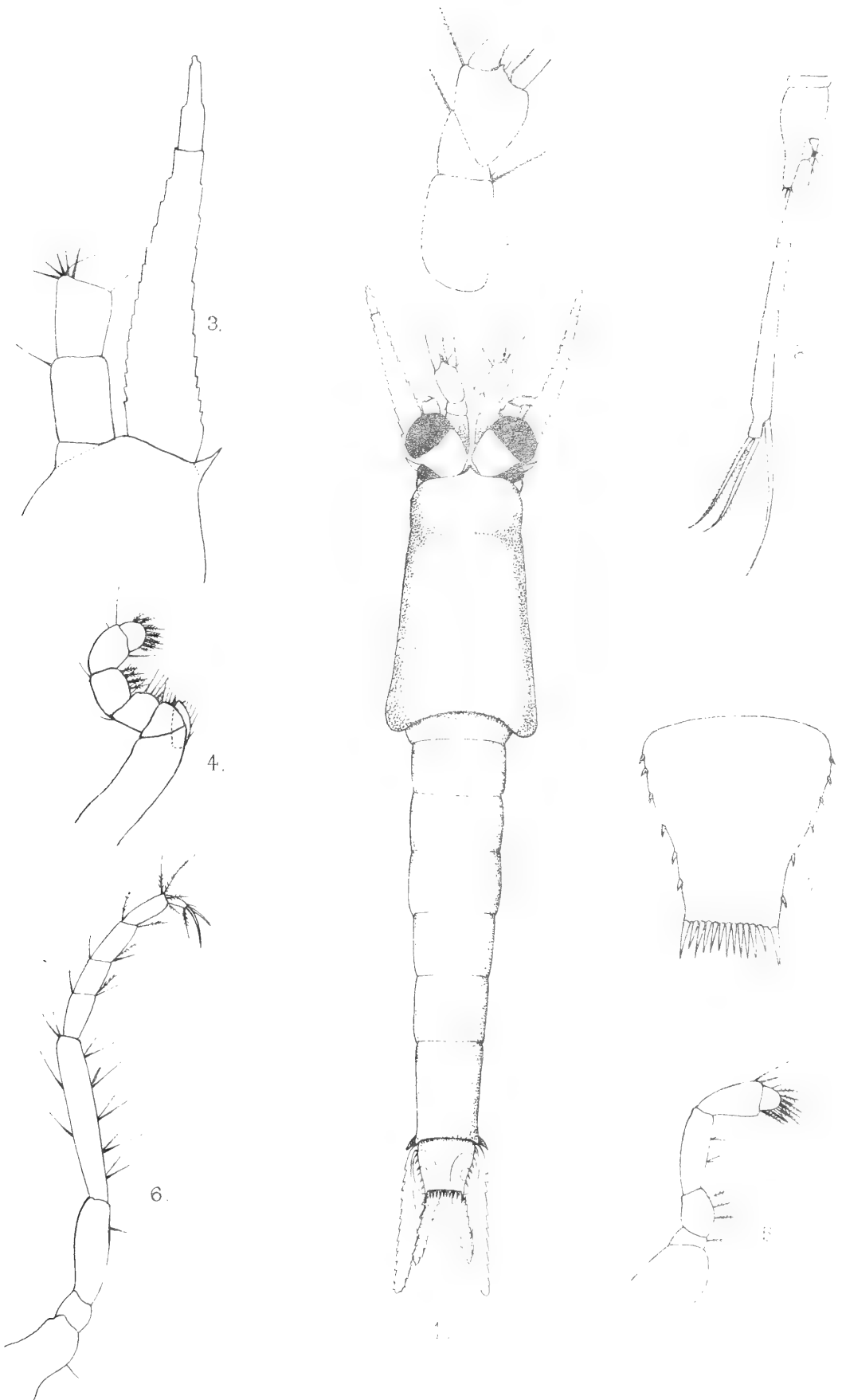




## EXPLANATION OF PLATE XXI.

POTAMOMYSIS ASSIMILIS, sp. nov.

- FIG. 1.—Adult female, 5 mm. long, dorsal view.  
,, 2.—Antennular peduncle,  $\times 100$ .  
,, 3.—Antennal scale and peduncle,  $\times 100$ .  
,, 4.—Endopod of first thoracic limb,  $\times 100$ .  
,, 5.—Endopod of second thoracic limb,  $\times 100$ .  
,, 6.—Endopod of eighth thoracic limb,  $\times 100$ .  
,, 7.—Telson,  $\times 100$ .  
,, 8.—Fourth pleopod of male, 4 mm.,  $\times 100$ .



POTAMOMYSIS ASSIMILIS, n. sp. A Chowdharykith

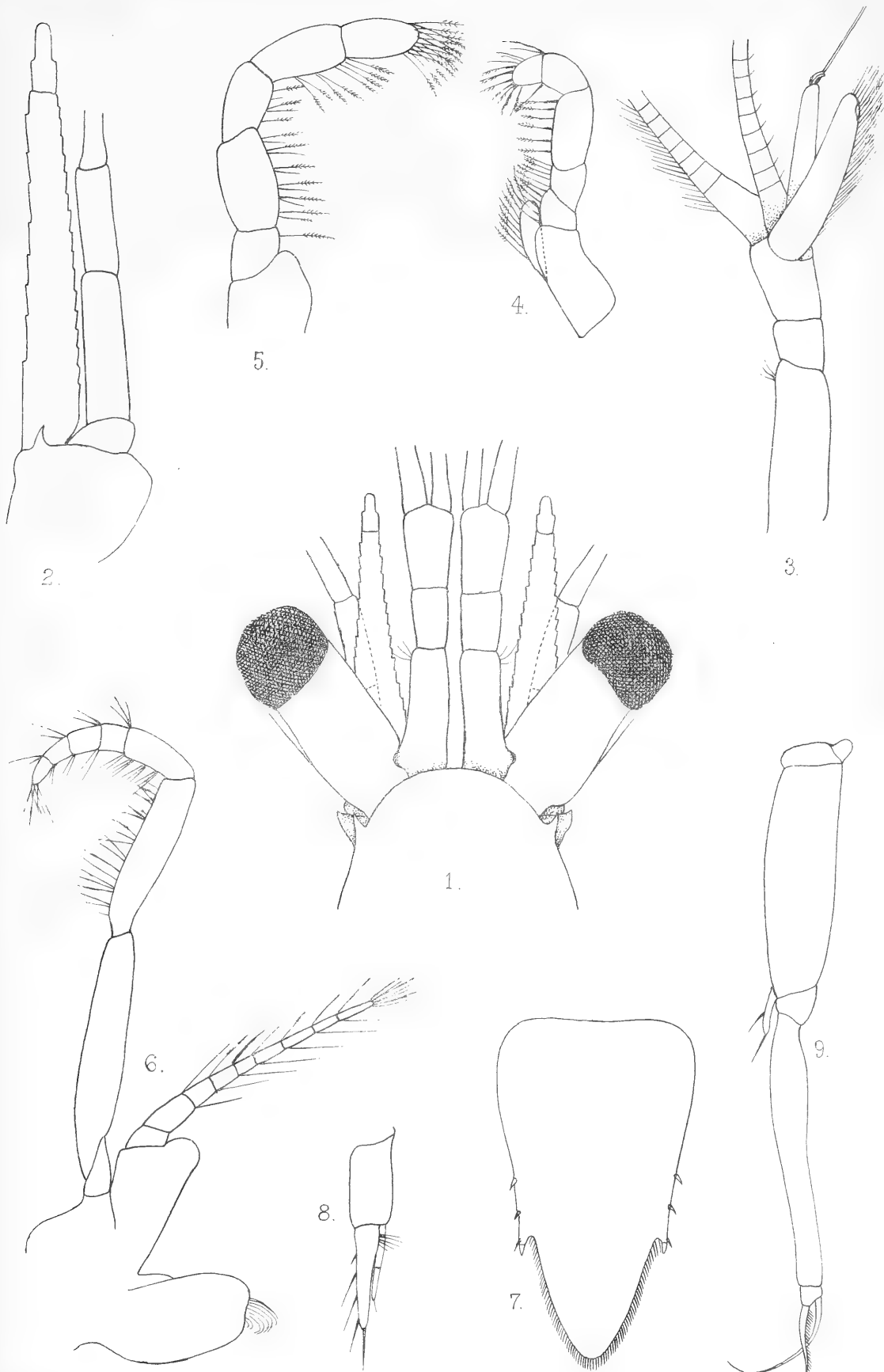




## EXPLANATION OF PLATE XXII.

*MACROPSIS ORIENTALIS*, sp. nov.

- FIG. 1.—Anterior end of a female 6 mm. long,  $\times 75$ .  
,, 2.—Antennal scale,  $\times 75$ .  
,, 3.—Antennule of male,  $\times 75$ .  
,, 4.—Endopod of first thoracic limb,  $\times 75$ .  
,, 5.—Endopod of second thoracic limb,  $\times 75$ .  
,, 6.—Eighth thoracic limb of male,  $\times 75$ .  
,, 7.—Telson,  $\times 75$ .  
,, 8.—Third pleopod of male,  $\times 75$ .  
,, 9.—Fourth pleopod of male,  $\times 75$ .







## XXVI. ON SOME ORIENTAL SOLIFUGÆ, WITH DESCRIPTIONS OF NEW FORMS.

By A. S. HIRST (*British Museum, Nat. Hist.*).

The new forms described in this paper (with the exception of *Galeodes fischeri* and *Eusimonia celeripes*) form part of the collection of the Indian Museum, Calcutta. It is owing to the kindness of Dr. N. Annandale that I have been enabled to examine and to describe them.

*Galeodes darius*, Pocock.

1895, *Ann. Mag. Nat. Hist.* (ser. 6), vol. xvi, p. 81; 1889-1900, *Journ. Linn. Soc.*, vol. xxvii, p. 403; 1905, Birula, *Bull. Acad. Imp. Sci. St. Petersburg* (ser. 5), vol. xxii, p. 260.

♀. *Mandible*.—Upper jaw armed with two minor intermediate teeth, the posterior one small. Lower jaw also with two minor teeth.

*Palpi*.—Patella armed ventrally with bristles which are alternately very long and rather short; tibia of palp with five or six pairs of spines, some of which exceed the height of the segment.

*Legs*.—Tarsi of second and third legs with seven spines, the posterior basal spine being absent. Tarsi of fourth legs with five pairs of spines.

*Locality*.—Fao, Persia.

*Remarks*.—This species is closely allied to *G. macmahoni*, Pocock, but differs in that the tibia of the tarsus is darkened.

*Galeodes aulicus*, sp. nov.

♂. *Colour*.—Pale sandy yellow; head and terga of abdomen infusate; mandibles pale above and marked with faint stripes; patella, tibia and tarsus of palp deeply infusate, the distal half of the femur dark or pale; first leg with tibia and tarsus darkened, the posterior legs entirely pale.

*Head*.—Width of head-plate about half the length of the patella of the maxillipalp and considerably less than the length of the tibia.

*Mandible*.—Blade of flagellum resembling that of *G. agilis*, Pocock. Lower jaw with one or two minor teeth.

*Palpi*.—Patella armed with four long and strong ventro-lateral spines and with a median row of spines, tibia with six (in one of the specimens with only four) pairs of strong and rather short spines, the anterior pair, however, exceeding the height of the segment; "cylinder-bristles" absent.

*Legs*.—Tarsi of second and third legs with four pairs of spines, tarsi of fourth legs with five pairs of spines, bristles of tarsus of fourth leg stout and a little curved.

*Measurements in mm.*—Length of body 34; width of head 11·5; length of patella of palp 23·5; of tibia of palp 15·5; of tarsus of palp 3·5.

*Locality*.—Seistan. Two males (one of them mutilated) collected by Col. MacMahon.

*Remarks*.—This new species agrees with *G. citrinus*, Pocock, and *G. schach*, Birula, in the absence of "cylinder-bristles" from the ventral surface of the palp, but differs from them in having the distal segment of the tarsus of the fourth legs armed with a pair of spines.

*Galeodes festivus*, sp. nov.

♂. *Colour*.—Pale sandy yellow; head with a pair of dark lateral patches; abdomen with the anterior and posterior margins of the terga darkened; mandibles fawn-coloured above and with well marked stripes; patella, tibia and tarsus (with the exception of its distal extremity) of maxillipalp deeply infusate, the patella almost as dark as the tibia; femur of maxillipalp with the distal third darkened; fourth pair of legs with the distal segments strongly infusate; the anterior legs paler.

*Mandibles*.—Lower jaw with two minor teeth, the posterior one being minute. Blade of the flagellum narrower as compared with the length than is the case in *G. agilis*, Pocock.

*Palpi*.—Patella about twice as long as the width of the head, and armed below with three rows of spines, some of which exceed the height of the segment; tibia with six pairs of spines, the distal pair alone exceeding the height of the segment; "cylinder-bristles" fairly slender, subcylindrical and with the basal rings rather high.

*Legs*.—Tarsi of second and third legs armed with seven spines, the posterior basal spine being absent. Tarsi of fourth legs with five pairs of spines. Bristles of tarsi of fourth pair of legs broader and less sharply pointed than is the case in *G. agilis*. Blade of external malleolus less than half the width of the head.

*Measurements in mm.*—Length of body 42; width of head 10; length of palp 62; of first leg 45; of fourth leg 61; of patella of palp 21·5; of tibia of palp 15; of tarsus of palp 3·75.

*Locality*.—Seistan, a single male specimen collected by Col. MacMahon.

*Remarks*.—This species is closely allied to *G. agilis*, Pocock, differing from it in the shape of the bristles of the tarsi of the fourth legs.

*Galeodes truculentus*, Pocock.

1889-1900, *Journ. Linn. Soc.*, vol. xxvii, p. 402; 1905, Birula, *Bull. Acad. Imp. Sci. St. Petersburg* (ser. 5), vol. xxii, pp. 252 and 253.

This species is very closely allied to (perhaps identical with) *G. araneoides*, Pallas. The bristles of the pad of the fourth leg, however, are broad and not very sharply pointed.

♂. *Mandible*.—Lower jaw with three minor teeth.

*Palp* with the patella a little more than twice the width of the head.

*Legs*.—Tarsi of second and third legs with four pairs of spines. Tarsus of fourth leg with four pairs of spines.

*Remarks*.—The fourth leg of the male measures 50 mm. and not 60 mm. as stated in Mr. Pocock's description.

*Galeodes citrinus*, Pocock.

1895, *G. citrinus*, Pocock, *Ann. Mag. Nat. Hist.* (ser. 6), vol. xvi, p. 81; 1889-1900, *G. citrinus*, Pocock, *Journ. Linn. Soc.*, vol. xxvii, pp. 403 and 404; 1900, *G. nigripalpis*, Pocock, *Fauna of British India*, Arachnida, p. 144; 1905, *G. citrinus*, Birula, *Bull. Acad. Imp. Sci. St. Petersburg* (ser. 5), vol. xxii, p. 254; *G. pococki*, Birula, *loc. cit.*, p. 256.

*Mandible*.—Lower jaw with a single minor tooth.

*Palpi*.—Patella twice or a little more than twice the width of the head-plate; tibia ventrally without cylinder-bristles.

*Legs*.—Tarsi of second legs with four anterior spines and two posterior spines (one on each segment); tarsi of third legs usually armed with seven spines (the posterior basal spine being absent) or with the same armature as the second legs. Tarsi of fourth legs with four pairs of spines, the distal segment unspined.

There are two forms of this species—

- (1) The typical form: Colour paler than in the variety *nigripalpis*; tarsus of palp pale yellow; legs not darkened; size large (up to 40 mm.); locality Jask.
- (2) Var. *nigripalpis*, Pocock: Tarsus of palp infusate; legs slightly darkened; abdominal terga much darker than in the typical form; size smaller (up to 29 mm.); locality Omara, Baluchistan.

*Galeodes indicus*, Pocock.

1900, Pocock, *Fauna of British India*, Arachnida, pp. 142-144.

Dr. Birula compares this species with his *G. auronitens*. The two species are not closely allied, however, for *G. auronitens* belongs to the *caspicus* group, whilst *G. indicus* belongs to the *araneoides* group. Pocock says in his description of *G. indicus* "Tarsi of legs armed as in *G. fatalis*, except that the distal segment is spined." The word 'spined' in this sentence is a misprint for 'unspined,' for in *G. fatalis*, Licht. and Herbst, the distal tarsal segment of the fourth leg is spined, whilst this is not the case in *G. indicus*.

*Galeodes chitralensis*, sp. nov.

♂. *Colour*.—Paler than in *G. indicus*, Pocock; head scarcely darkened, but darker than the legs, which are sandy yellow; ocular-

tubercle black; abdominal terga infusate; the ventral surface of the abdomen a dirty greyish colour; mandibles marked with faint stripes; palp pale yellow in colour.

*Mandibles*.—Lower jaw with two minor teeth which are close together and followed by a slight gap. Blade of flagellum somewhat longer and narrower than is the case in *G. indicus*.

*Palpi*.—Patella slightly more than twice the width of the head (in *G. indicus*, the patella of the palp is considerably more than twice the width of the head). Spines of the tibia six in number, the first and third alone exceeding in length the height of the segment; "cylinder-bristles" long and slender as in *G. indicus*.

*Legs*.—Tarsi of second and third legs armed with seven spines, the posterior basal spine having disappeared. Tarsi of fourth legs with four pairs of spines, the distal segment without spines; bristles of pad of tarsus narrower than in *G. indicus*. Blade of external malleolus about half the width of the head.

*Measurements in mm.*—Length of body 24·5; width of head 6·5; length of palp 39; of first leg 29; of fourth leg 41·5; of patella of palp 14; of tibia of palp 10·25; of tarsus of palp 3.

*Locality*.—Chitral, a single male specimen collected by Mr. F. J. Daley.

*Remarks*.—The male of this species differs from that of *G. indicus*, Pocock, in its much paler colour and shorter palpi.

*Galeodes chitralensis pallescens*, sub-sp. nov.

This sub-species structurally resembles the typical form, except in the armature of the lower jaw, which is armed with three minor teeth (it is probable that the lower jaw of the typical form is also normally armed with three teeth); the terga of the abdomen, however, are pale yellow in colour.

*Measurements in mm.*—Length of body 31·5; width of head 7·5; length of palp 46·5; of first leg 32·5; of fourth leg 49; of patella of palp 16·25; of tibia of palp 12; of tarsus of palp 3.

*Locality*.—Sambalpur, Central Provinces, India; a single male specimen collected by Mr. V. Ball.

*Galeodes fischeri*, sp. nov.

*Colour*.—Closely resembling that of *G. indicus obscurior*, Pocock.

♀. *Mandible* with the lower jaw armed with three minor teeth. Flagellum similar to that of *G. indicus*.

*Palpi*.—Shorter than in *G. indicus*, the patella about twice the width of the head; "cylinder-bristles" of tibia sparse, slender and very short, usually measuring considerably less than a quarter of the length of the spines, whilst in *G. indicus* they are often more than half the length of the spines.

*Legs*.—Proximal segment of tarsus of second and third legs provided with three spines anteriorly, the posterior side with a single spine, distal segment with a single spine, situated on the

anterior side. Tarsi of fourth legs with four pairs of spines; the distal segment unspined.

*Measurements in mm.*—Length of body 25; width of head 6.5; length of palp 42.5; of first leg 30.5; of fourth leg 43.5; of patella of palp 14; of tibia of palp 10.75; of tarsus of palp 3.

♀. *Mandible.*—Upper jaw with two minor teeth between the principal ones, dentition of lower jaw similar to that of the male.

*Palp.*—Patella and tibia with long and slender spines as in *G. indicus*.

*Legs.*—Blade of external malleolus almost equalling the breadth of the ocular tubercle.

*Measurements in mm.*—Length of body 24; width of head 7.75; length of palp 35; of first leg 25; of fourth leg 36.5; of patella of palp 11; of tibia of palp 9; of tarsus of palp 3.

*Locality.*—North Coimbatore District, Madras, three males and two females collected by Mr. C. E. C. Fischer.

*Remarks.*—This species differs from *G. indicus*, Pocock, in that the “cylinder-bristles” of the tibia of the palp are very short.

*Galeodes bacillifer*, Pocock.

1900, *G. bacillifer*, Pocock, *Fauna of British India*, Arachnida, p. 144; 1904, *G. bacillifer*, Birula, *Ann. Mus. Zool. Acad. St. Petersburg*, vol. ix, p. 395; 1905, *G. bacillifer*, Birula, *Bull. Acad. Imp. Sci. St. Petersburg* (ser. 5), vol. xxii, p. 256.

The tibia of the palp of the male is provided ventrally with a few very long and slender “cylinder-bristles” in the typical specimen. These bristles are confined to the basal half of the segment. In the specimens determined by Dr. Birula as belonging to this species the “cylinder-bristles” are said to be absent.

*Galeodes annandalei*, sp. nov.

*Colour.*—Yellowish white; head greyish above, the ocular tubercle black; abdomen with the terga darkened, its ventral surface greyish yellow; mandibles slightly darkened above and marked with broad stripes; patella, tibia and tarsus of palp and the femora and patellæ of the legs slightly infusate.

*Mandibles* with upper jaw provided (between the principal teeth) with two minor teeth of fairly large size, lower jaw with three minor teeth.

*Palpi.*—A little shorter than in *G. bacillifer* (see measurements); patella armed with long and thin spines as in *G. indicus* and *bacillifer*; tarsus with a pair of strong bristles as in *G. bacillifer*.

*Legs.*—Tarsi of second and third legs ventrally with four pairs of spines; tarsi of fourth legs also with four pairs of spines, the distal segment being unspined.

*Abdomen.*—Fifth abdominal segment ventrally with a curved row of thin yellowish bristles,

*Measurements in mm.*—Length of body 27·5; width of head 7·5; length of palp 37·5; of first leg 25; of fourth leg 41·5; of patella of palp 12·5; of tibia of palp 10; of tarsus of palp 2·5.

*Locality.*—Malakand, N.-W. Frontier of India; a single female example.

*Remarks.*—This new species is closely allied to *G. bacillifer*, Pocock, but is darker in colour, the abdomen being ornamented above with a dark band.

The following key shows some of the principal differences between the males of the species of *Galeodes* (sub-gen. *Galeodes*) that I have been able to examine:—

- |   |   |  |                              |
|---|---|--|------------------------------|
| 1 | { | <sup>1</sup> Distal segment of tarsus of fourth leg armed below with a pair of spines    | 2                            |
|   |   | Distal segment of tarsus of fourth leg without spines .. .. .                            | 7                            |
| 2 | { | Tibia of palp furnished ventrally with "cylinder-bristles" .. .. .                       | 3                            |
|   |   | Tibia of palp ventrally without "cylinder-bristles" .. .. .                              | <i>G. aulicus</i> , Hirst.   |
| 3 | { | Proximal tarsal segment of second and third legs with a posterior basal spine .. .. .    | <i>G. afghanus</i> , Pocock. |
|   |   | Proximal tarsal segment of second and third legs without a posterior basal spine .. .. . | 4                            |
| 4 | { | Tibia of palp fuscous .. .. .  | 5                            |
|   |   | Tibia of palp yellow .. .. .   | <i>G. macmahoni</i> , Pocock |
| 5 | { | Size large (over 40 mm.); yellow; patella of palp twice width of head                    | 6                            |
|   |   | Smaller (about 30 mm.); browner; patella of palp less than twice width of head .. .. .   | <i>G. orientalis</i> , Stol. |
| 6 | { | Bristles of pad of tarsus of fourth leg broad, their ends abruptly pointed               | <i>G. festivus</i> , Hirst.  |
|   |   | Bristles of pad of tarsus very much narrower, their ends sharply pointed .. .. .         | <i>G. agilis</i> , Pocock.   |
| 7 | { | Tibia of palp furnished ventrally with "cylinder-bristles" .. .. .                       | 8                            |
|   |   | Tibia of palp ventrally without "cylinder-bristles" .. .. .                              | <i>G. citrinus</i> , Pocock. |
| 8 | { | "Cylinder-bristles" of tibia of palp long (either slender or stout) .. .. .              | 9                            |
|   |   | "Cylinder-bristles" of tibia of palp very stout, slender and cylindrical                 | <i>G. fischeri</i> , Hirst.  |

<sup>1</sup> The posterior legs of the male specimen of *G. afghanus*, Pocock, are missing. The female which is supposed to belong to this species, however, has the distal segment of the fourth leg armed below with a pair of spines.

- |    |   |   |                                 |
|----|---|---|---------------------------------|
| 9  | { | Bristles forming pad of tarsus of fourth leg not clavate in shape ..                        | 10                              |
|    | { | Bristles forming pad of tarsus of fourth leg clavate in shape ..                            | <i>G. bacillifer</i> , Pocock.  |
| 10 | { | Proximal tarsal segment of second and third legs without a posterior basal spine .. ..      | 11                              |
|    | { | Proximal tarsal segment of second and third legs usually with a posterior basal spine .. .. | <i>G. araneoides</i> , Pallas.  |
| 11 | { | Legs sandy yellow, patella of palp twice the width of the head ..                           | <i>G. chitralensis</i> , Hirst. |
|    | { | Legs browner, patella of palp considerably more than twice the width of the head .. ..      | <i>G. indicus</i> , Pocock.     |

*Eusimonia celeripes*, sp. nov.

*Colour*.—Pale yellow; head infusate; abdomen greyish yellow; palpi and legs slightly infusate.



Mandible of *Eusimonia celeripes*, Hirst.

*Mandible*.—Dorsal horn short, pointed and slightly curved; Flagellum strongly curved, the terminal part abruptly narrowed and sharply pointed. Vertical lamina with the lower corner not rounded but angular. Upper jaw with the fourth, seventh and eighth teeth (from the anterior end) the largest; the first, third, sixth, ninth and tenth of large size, the remaining teeth being small. Lower jaw furnished with a strong tooth, which is usually preceded by two or three rudimentary teeth.

*Palpi*.—Inner side of tibia of palp armed towards the distal end with six spines, the ends of which are blunt and often enlarged; the proximal spine is the largest.

*Abdomen*.—Third abdominal segment provided with a cluster of 6-7 short and stout bristles. Fourth abdominal segment with twelve long and slender bristles.

*Measurements in mm.*—Length of body 10.5.

*Locality*.—Kaschgar Steppe. Three males collected by Mr. Constantine Aris.

*Remarks*.—This species is closely allied to *E. turkestanica*, Kraepelin, from which it differs in the form of the flagellum, dentition of the mandibles, and in the number of bristles on the ventral surface of the fourth abdominal segment.





XXVII. THE DIFFERENCE BETWEEN THE  
TAKIN (*BUDORCAS*) FROM THE MISHMI  
HILLS AND THAT FROM TIBET, WITH  
NOTES ON VARIATION DISPLAYED BY  
THE FORMER.

By T. BENTHAM, *Indian Museum.*

(Plate xxiii.)

In the collection of the Indian Museum there are twelve skulls and frontlets of *Budorcas taxicolor*, nine of which are known to come from the Mishmi Hills and one from E. Tibet, two having no known history. In the Mishmi series, two sets of skulls can be so arranged that they show a marked difference in rise from the young to the adult stage. This rise is marked by the gradual approximation of the horns. The youngest of the series, which are all males, has the horns at their bases quite two inches apart, and this distance gradually becomes less and less until we eventually arrive at a specimen in which the horns are coincident and very large. The only Tibetan species, which is a young adult, seems to possess horns which are almost identical in size and distance apart with No. 2 of the Mishmi series. This almost serves to point out that Mishmi and Tibetan animals cannot with certainty be distinguished by the size, shape, or distance apart of their horns. The only thing that can be said on this point is that the horns are very variable and that this variability seems to be consequent on the age of the animal. (For description of horns cf. Chalmers Mitchell, *Proc. Zool. Soc.*, 1907, p. 467; Lydekker, *Game Animals of India*, etc., p. 162; Hodgson, *Journ. Asiat. Soc. Bengal*, vol. xix, p. 65; Milne Edwards, *Réch. des Mam.*, 1868-74, p. 367.)

A more important point lies in the shortness and broadness of the nasal bones of the *Budorcas* from Tibet, as compared proportionately with all the Mishmi specimens. This feature carries with it a larger space to the opening of the nasal chamber, which is deeper and higher than in the animal from Assam. In referring to the nasal chamber it must also be noted that in the Tibetan skull the ridges starting from the edge of the maxilla at the junction of this bone with the premaxilla and lying on the floor of the nasal chamber are far less marked than in the Mishmi skull (see pl. xxiii, A and B, figs. 2 and 3). This last statement also applies to the pits underlying the vomer, which are larger and deeper in the Mishmi animal. The difference in these ridges undoubtedly shows that as a consequence of their development the maxillo-turbinals are far more developed in the Assam form than in that from Tibet, a fact

which is not altogether surprising, since the Mishmi Takin lives in jungle, where its sense of smell would be more indispensable than if its habitat were on the bare plateaux of Tibet.

The premaxilla is longer in the Tibetan skull, proportionately, and more slender than in the other specimens. This is also quite evident in Milne Edward's drawing of the nose-cavity in a specimen from Moupin.<sup>1</sup>

In the skeleton the only difference between the Assam and Tibetan forms seems to lie, as far as can be judged from the same author's plates, in the humerus. This difference probably is not important, perhaps being due to age. The outer tuberosity of the Mishmi humerus is larger and has a greater curve inwards than that in the Moupin humerus figured. The bicipital groove is therefore deeper. The deltoid ridge also is more strongly marked. The anterior cannon-bone is shorter and broader in proportion in the Tibetan *Budorcas*, while with regard to the posterior cannon-bone the reverse is the case.

Comparison of Mishmi skins *inter se* exhibits great variation. The colour in males varies from russet-brown to light straw-grey. In no individuals are the dark parts pure black. In fact the younger the animal is, the darker the colour of the skin. The following is a list of the observations taken from skins ranging in age from young to fully adult:—

*Budorcas taxicolor*, ♂ *Skins from Assam: Age Series.*

Serial No.	Length of horn.	Length of anterior hoof, front face.	Colour.
1	None	1.25 in.	Uniform dark russet-brown; legs and a small patch on the nose inclining to black; dorsal streak very faint and more marked on hind quarters; interior of ears, a patch on the loins, a small patch over eye light brown.
2	.75 in.	2.25 in.	Hair becoming lighter and more golden in colour at the tips along the edge of the dorsal streak, which is now better marked and is beginning to show signs of appearing between shoulders. Rest of the skin as in No. 1.
3	2.5 in.	2.5 in. ..	Dorsal streak quite well marked and dark brown, the hairs having black tips. More yellowish colour on the back which, mingling with the reddish brown hairs it is replacing, gives the back in parts a greenish appearance. A light patch beginning to be evident on the forehead.

<sup>1</sup> *Récherches des Mammifères* (Paris), 1868-74, pl. lxxvi.

Serial No.	Length of horn.	Length of anterior hoof, front face.	Colour.
4	21 in.	3 in.	Whole of back yellow, varying from straw colour nearer the dorsal streak to chestnut on the sides. Crescentic patch on forehead and the lining to ears straw colour. Rest of head, as also flanks, very dark brown. Under parts dark brown, the hairs of legs tipped black.
5	22 in.	3.25 in.	Altogether duller; the dorsal streak beginning to disappear. General colour of the upper parts drab straw colour with a slight greenish tinge. Under parts almost black. Nearest to the Tibetan specimen in colour, and also to Hodgson's original description of the type, although it is not the same specimen.

The two females in the collection also show a decided difference *inter se*, no doubt due to age. In both the dark dorsal stripe present in the males is faint and nearly absent; the younger animal exhibits the browner tendencies shown in the younger males, while the older one is greyer in appearance. Both skins are larger than any male skin in the Museum's possession. This indicates that the female may be larger than the male, if the evidence of the dry skins is anything to go upon.

The Tibetan skin shows the following coloration, approaching the oldest Mishmi example in appearance:—

General colour above yellowish fawn inclining to grey, the hairs at their bases being straw colour; hair of back lighter straw colour along the edges of the dorsal streak, the hair of which is dark brown with black tips. Dorsal streak extending from root of tail, which is black, to the middle of the shoulders, where it gives way to a straw coloured stripe extending across the occiput to the forehead<sup>1</sup> behind the ears and between the eyes. A small light patch at the anterior corner of the eye, and the interior of the ears straw coloured; hair of the muzzle and sides of head black, some of the hairs being different shades of brown and straw colour at their bases; long hairs at sides of body light dull grey with long black tips; a small russet-brown patch above each hoof.

The following is an abstract of Mr. Lydekker's description of *Budorcas taxicolor whitei* in the *Field* of November 16th, 1907, this sub-species having been formed on four specimens from Bhutan.

<sup>1</sup> Hodgson had a model of the Mishmi Takin sent him. This was made by a Mishmi chief, and had a light yellow half-moon mark on the forehead; *vide Journ. Asiatic Soc. Bengal*, vol. xix, p. 69.

The first two specimens were both adult (a male and a female), and the horns of the bull were shorter than those of the cow. The second two were those of an immature male and adult female. From this evidence Mr. Lydekker states that the horns of an adult Bhutia bull would have been 14 to 15 inches in length as compared with 20 to 24 in the Mishmi Takin. But, from the statistics quoted, the same thing might be said with regard to the Tibetan Takin as compared with the Mishmi form. It appears, also, that the yellow colour of the hair in the animal from Bhutan is intermediate in area between that of Mishmi and that of Tibetan examples. The yellow colour of the hair is seemingly also intermediate between the two extremes in some representatives of the same Mishmi race. Indeed, one example of this race in the Museum is almost identical in appearance with the Tibetan animal.

A grey Takin is mentioned by Mr. Lydekker<sup>1</sup> as coming from Sze-chuen, and he proposes to form a new sub-species for its reception. The animal is a female and is light grey on the upper parts.

The gentleman who sent the specimen to Mr. Rowland Ward says that there are two kinds of Takin in Sze-chuen, one a small red animal and the other a large grey one. It is not improbable that the female *Budorcas* is larger than the male, and I have shown that the young are dark russet-brown, and the adults light in appearance. It is probable that the small "race" mentioned consists simply of young examples of the large grey form, and, as is quite common among ungulates, that the young separate into flocks, while the adult males or females, as the case may be, go about singly or in pairs. An observant person could, with the greatest ease, make at least three sub-species from the Mishmi skins in the Indian Museum, if they had chanced to be from different localities simply on the evidence of coloration and variation of horns. I may also mention that we have two stuffed specimens from the Mishmi Hills in addition to those already noticed. These are presumably adult, and though they are somewhat faded, it can easily be seen that the female is larger and greyer in appearance, standing 3 feet 5 inches at the shoulder, while the male is reddish, and is only 2 feet 8 inches in height. These animals, looked at from a great distance, would be thought to be distinct species.

On the evidence of the facts stated above, I am perfectly willing to admit that the Mishmi and Tibetan animals are distinct, not so much on the evidence of coloration, but on that of the characteristics of the skull, on which the Tibetan animal perhaps deserves specific rank.

In the face, however, of the occurrence of so much variation in Mishmi animals, it is quite reasonable to suppose that a like variation occurs among those beyond the hills.

Appended is a list of measurements of skulls and skeletons of the ♂ specimens in the Indian Museum and of the one described by Milne Edwards.

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<sup>1</sup> In the *Field* of May 9th, 1908.

[NOTE.—Since writing this paper I have been permitted by Mr. I. H. Burkill of the Industrial Section, Indian Museum, to examine a shield from the Daffla Hills made of *Budorcas* hide. This skin is probably that of a young animal and is brownish in appearance, the dorsal stripe being indistinct. This fact is interesting only as regards the distribution of the Takin, if we may assume that the skin is that of an individual killed in the Daffla and not in the Mishmi Hills.]

### Measurements of Skulls.

Measurements in millimetres.	Mishmi average.	♂ Mishmi Hill s. A. R. Comber.	♂ Mishmi Hill s. E. T. Dalton.	♂ Mishmi Hills.	♂ Mishmi Hills.	♂ Tibet. Milne Edwards (juv.).	♂ E. Tibet (juv.).
Basal length of skull ..	386	395	375	415	360	400	353
Breadth between orbits ..	145	165	144	145	125	93	134
Length nasals ..	136	142	136	150	115	..	98
Breadth nasals ..	77	98	70	88	70	58	80
Depth from highest point of nasals to lowest point of maxilla ..	167	174	168	171	154	130	143
Length of premaxilla ..	149	155	155	158	130	..	130
Length from tip of nasals to end of premaxilla ..	147	171	147	143	128	..	135
Breadth between premaxillæ at junctions with maxillæ ..	91	98	93	98	75	..	75
Length from between horns to end of nasals ..	251	245	247	268	243	..	215
Length of maxillary tooth-line ..	124	122	131	115	127	..	120
Length from first pre-molar to end of premaxilla ..	120	135	115	125	105	..	99
Length of space between the horns at base ..	14	20	coincident.	15	7	..	25
Length of horn ..	571	544	571	514	408	480	365
Circumference at base of horn ..	285	290	323	294	235	320	235
Length tip to tip ..	245	328	265	220	185	330	160
Length from coronoid process to angle ..	146	..	138	..	155	..	134
Breadth from third molar to angle ..	94	..	93	..	95	..	75
Length of mandibular tooth-line ..	125	..	125	..	125	..	119

## Measurements of Skeletons.

Measurements in millimetres.	♂ <i>Budorcas taxicolor</i> (tibetanus), Alphonse Milne Edwards.	♂ <i>Budorcas taxicolor</i> , Mishmi Hills, Assam.	♂ <i>Budorcas taxicolor</i> , Mishmi Hills.	♂ juv. <i>Budorcas taxicolor</i> , Mishmi Hills.
Length of the humerus	315	262	310	260
Transverse diameter of the superior extremity of the humerus ..	101	86	110	70
Thickness of the great tuberosity ..	33	35	37	25
Minimum diameter of the diaphysis ..	36	48	70	53
Length of the inferior extremity of the humerus ..	69	61	65	60
Length of the radius ..	275	250	265	210
Length of the superior extremity of the radius ..	61	51	69	58
Breadth of the inferior extremity of the radius ..	58	48	80	55
Length of the ulna ..	365	217	350	250
Length of the anterior cannon bone ..	103	120	130	Anterior cannon-bone missing.
Minimum breadth of the anterior cannon-bone ..	44	30	50	
Maximum breadth of the anterior cannon-bone ..	65	50	69	
Minimum thickness of the anterior cannon-bone ..	20	21	25	
Length of the femur ..	335	273	Femur missing, also posterior cannon-bone.	288
Transverse diameter of the superior extremity of the femur ..	95	80		85
Maximum diameter of the diaphysis ..	31	40		42
Transverse diameter of the inferior extremity ..	81	74		78
Antero-posterior diameter of the inferior extremity ..	83	80		85
Length of the posterior cannon-bone ..	151	114		120
Minimum transverse diameter ..	33	43	Shorter and broader in proportion.	30
Maximum transverse diameter ..	56	59		50

Broader and shorter in proportion.

Longer and narrower in proportion.



EXPLANATION OF PLATE XXIII.

- FIG. 1.—Floor of nasal chamber in skull of *Budorcas* from Assam.  
,, 2.—Floor of nasal chamber in skull of *Budorcas* from E. Tibet.  
A = Pit. B = Ridge separating the pits. T = Maxillo-turbinal.





A  
A  
B  
C

Premaxilla

Premaxilla

Fig. 1.



XXVIII. ON *CARIDINA NILOTICA* (ROUX)  
AND ITS VARIETIES.

By Dr. J. G. DE MAN, *Ierseke, Holland.*

The collection of Crustacea obtained from brackish water ponds at Port Canning, Lower Bengal, which is described at p. 211 of this Journal, comprised also very numerous specimens of a variety of *Caridina nilotica* (Roux) which proved to be new. As our knowledge of this species and its varieties appears still much confused and unsatisfactory, the present paper will, I think, be welcome.

The typical species, *Caridina nilotica* (Roux) from the Nile, was described by Roux, as a *Pelias*, in the *Annales des Sciences Naturelles*, t. xxviii, 1833, p. 73, pl. 7.

Compare the following papers:—

*Hickson, S. J.*, On a new Species of the genus *Atya* (*A. wyckii*) from Celebes, in: *Annals and Magaz. of Natural History* for Nov. 1888, p. 357, pls. xiii, xiv.

*de Man, J. G.*, in: *Max Weber's Zoolog. Ergebnisse einer Reise nach Niederl. Ost-Indien*, ii, 1892, p. 386, pl. xxiv, figs. 29, 29 k.

*Max Weber*, Zur Kenntniss der Süßwasser-Fauna von Süd-Afrika, in: *Zoolog. Jahrbücher* (Spengel), Abth. f. System. x, 1897, p. 168.

*Schenkel, E.*, in: *Verhandl. der Naturf. Gesellschaft in Basel* xiii, 1902, Heft 3, pp. 497-499.

*de Man, J. G.*, in: *Abhandl. der Senckenberg. Naturf. Gesellschaft*, xxv, 1902, p. 895.

*Bouvier, E. L.*, in: *Bulletin Scientif. de la France et de la Belgique*, t. xxxix, 1905, pp. 78-80.

*Calman, W. T.*, in: *Proceed. Zoolog. Soc. London*, 1906, vol. i, p. 189.

The following material lies before me:—

1. Twenty-three specimens, some of which are adult and egg-bearing, collected, December 1903, in ponds and canals near Cairo, Egypt, and presented to me by Capt. S. S. Flower, Director of the Zoological Gardens at Giza, near Cairo, January 1904.
2. Twenty specimens, some of which are egg-bearing, of *Caridina longirostris*, H. M. Edw., from the river Macta, near Oran, co-types, received in 1890 from the

Museum at Paris ; these specimens have already been described by me in my paper of 1892 (*l.c.*).

3. An egg-bearing female and a younger specimen without eggs from the Lake Victoria Nyanza, Bay Kavirondo, received, May 1904, from Prof. E. L. Bouvier,—*Caridina wyckii*, Hicks., var. *paucipara*, de Man ; these specimens were collected, Sept. 1903, by M. Alluaud.
4. Three egg-bearing females from the river Umgeni, Natal, collected Nov. 1894, and received from Prof. Max Weber,—*Car. wyckii*, Hicks.
5. Six adult specimens, three of which are ova-bearing, from the river Umhlasine, Natal, collected by Prof. Max Weber in 1894 and presented by him,—*Car. wyckii*, Hicks. var. *paucipara*, M. Weber.
6. One egg-bearing adult female and 60 young specimens collected by Dr. N. Annandale, Jan. 28—30th, 1906, in brackish water ponds at Port Canning, Lower Bengal.
7. Fourteen ova-bearing adult females and 48 younger specimens collected, Nov. 12th, 1906, in the same locality.
8. Twenty-four ova-bearing females of somewhat smaller size than the preceding and 40 young specimens gathered, Dec. 8th, 1906, in the same locality.
9. Four specimens, one of which is adult, collected at Dhappa, near Calcutta, in slightly brackish water.
10. Three adult specimens with eggs from the river near Palopo, Luwu, Celebes, described by me, *l.c.*, 1892, p. 388, as the typical form of *Car. wyckii*.
11. Three adult specimens with eggs, from the river near Mbawa, Flores, described by me, *l.c.*, 1892, p. 393, also as the typical form of *Car. wyckii*.
12. Three adult females with eggs from Maros, Celebes, described by me, *l.c.*, 1892, p. 393, as the variety *gracilipes* of *Car. wyckii* (Hickson).

A punctual and close examination of this large interesting material and accurate measurements of the thoracic legs led to the following results :—

- (a) *Caridina longirostris*, H. M. Edw., from Oran is not identical with *Car. nilotica* (Roux) from Egypt, but proved to be a *distinct variety* of it.
- (b) The specimens from Lake Victoria Nyanza ought not to be referred to the var. *paucipara*, M. Weber<sup>1</sup> ; as regards the measurements of their legs, they almost fully resemble the var. *gracilipes*, de M., from Celebes,

<sup>1</sup> Prof. Bouvier in his valuable paper on the *Atyidae* (*l.c.*, 1905), erroneously supposes this variety to have been described by me.

but they agree with the typical *nilotica* from Egypt by the large size of their eggs.

- (c) The specimens collected in the river Umgeni, Natal, were wrongly referred by Prof. Weber to *Car. wyckii*, Hicks.; they ought to be considered as a distinct variety *natalensis* nov.
- (d) The specimens obtained from Port Canning and from Dhappa, Lower Bengal, though closely related to the var. *gracilipes* from Celebes, are, at least for the present, to be regarded as a distinct and new variety *bengalensis* nov.
- (e) The specimens from the river near Palopo, Luwu, Celebes, from the river near Mbawa, Flores, and from the other localities mentioned by me, *l.c.*, 1892, p. 386, are not to be referred to *Car. wyckii* (Hicks.), but ought to be considered as a proper variety, for which the name of *brachydactyla* nov. is proposed.
- (f) According to Dr. Calman (*l.c.*, p. 190), the co-types of Prof. Hickson's species from Celebes should have the carpus exactly as in the types of *longirostris*; they are therefore different from the var. *brachydactyla* and ought to be considered as a distinct variety *wyckii* (Hicks.).
- (g) All the varieties living on the islands of the Indian Archipelago and in Bengal are certainly distinct from those occurring in Africa.

The typical *Car. nilotica* (Roux) inhabits Egypt (the Nile, freshwater ponds and canals); its at present known varieties are the following :—

- |  |  |
|--|--|
| 1. var. <i>longirostris</i> , H. M. Edw. | River Macta, Oran.   |
| 2. var. <i>natalensis</i> , n.           | Natal.   |
| 3. var. <i>paucipara</i> , M. Weber.     | Natal.   |
| 4. var. <i>bengalensis</i> , n.          | Bengal.  |
| 5. var. <i>wyckii</i> , Hicks.           | Lake Tondano, Minahassa,<br>Celebes, at a height of 2,000<br>feet above sea-level. |
| 6. var. <i>minahassa</i> , de M.         | Minahassa, Celebes.  |
| 7. var. <i>brachydactyla</i> , n.        | Celebes, Saleyer, Flores.  |
| 8. var. <i>gracilipes</i> , de M.        | Celebes, Saleyer.  |

#### *Key to the varieties of Caridina nilotica (Roux).*

- I. Number indicating the proportion between length and breadth of the carpus of 1st pair of legs usually 2 or more than 2; rarely falling to 1.8, or quite exceptionally to 1.66 (var. *bengalensis*).

- a. Dactylus of 3rd pair of legs always longer than  $\frac{1}{5}$  of the propodite (number indicating the proportion between the length of both joints varying between 3.3 and 4.6); dactylus of 5th pair also longer than  $\frac{1}{5}$  of the propodite (the number of proportion varying between 2.87 and 4.5).
- b. Number indicating the proportion between length and breadth<sup>1</sup> of the dactylus of 3rd pair less than 4.
- c. Number indicating the proportion between length and breadth of the dactylus of 5th pair varying between 4 and 4.6; dactylus of 5th pair with 40—50 spinules.
- d. ova 0.7—0.86 mm. long .. *nilotica* (Roux).
- dd. ova 0.42—0.46 mm. long .. *natalensis*, nov.
- cc. Number indicating the proportion between length and breadth of the dactylus of 5th pair varying between 4.6 and 6.2; dactylus of 5th pair with 60—74 spinules; ova 0.96—1.06 mm. long. .. .. *paucipara*, M. Weber.
- bb. Number indicating the proportion between length and breadth of the dactylus of 3rd pair usually larger than 4, of 5th pair varying between 5 and 6.
- e. Number of proximal teeth of the upper margin of the rostrum usually varying between 12 and 20; ova usually 0.35 mm. long, their length varying between 0.33 and 0.4 mm. .. .. var. *gracilipes*, de M.
- ee. Number of proximal teeth of the upper margin of the rostrum usually varying

<sup>1</sup> The breadth of the dactylus is measured at the level of the 1st lateral spinule.

between 20 and 24; ova usually 0.45 or 0.46 mm. long, varying between 0.42 and 0.49 mm.

.. var. *bengalensis*, nov.

aa. Dactylus of 3rd pair about  $\frac{1}{6}$  the length of the propodite (number indicating the proportion between the length of both joints varying between 5.8 and 6.2); dactylus of 5th pair  $\frac{1}{5}$ — $\frac{1}{6}$  of the propodite. Ova 0.39—0.44 mm. long

.. var. *brachydactyla*, nov.

II. Number indicating the proportion between length and breadth of the carpus of 1st legs usually less than 1.8, rarely rising to 1.9, but never reaching to 2.

f. Number indicating the proportion between the length of propodite and dactylus of 3rd pair larger than 5, of 4th pair, 4.

.. var. *wyckii* (Hicks.).

ff. Number indicating the proportion between the length of propodite and dactylus of 3rd pair usually less than 4, rarely reaching to 4.2; that of 5th pair always less than 4.

g. ova 0.55 mm. long .. var. *minahassa*, de M.

gg. ova 0.33—0.39 mm. long. .. var. *longirostris*, H. M. Edw.

Whereas in the foregoing key the principal characters are indicated by which the varieties may be distinguished, the following part contains my observations on the rostrum and on the thoracic legs.

# 1. *Caridina nilotica* (Roux), typical form.

## TABLE A.

(Plate xx, figs. 1, 1a, 1b.)

In the figure of Roux's quoted paper of 1833, the rostrum extends distinctly beyond the antennal scales; its upper margin carries 13 teeth, two of which are on the carapace, there is no subapical tooth, and the lower margin is armed with 14 teeth. In the 21 specimens from Cairo which lie before me, not one presents such a small number of teeth on the upper margin. On Table A

the toothing-formulae of the rostrum of 10 specimens are indicated, the other 11 specimens show the following toothing<sup>1</sup> :—

$$\frac{20^5 + 1}{14}; \quad \frac{20^2 + 1 + 1}{11} \text{ (young individual).}$$

$$\frac{21^2 + 1 + 2}{13} \text{ (young individual).}$$

$$\frac{22^5 + 1}{17}; \quad \frac{22^3 + 1 + 1}{15}.$$

$$\frac{23^3 + 1}{14}; \quad \frac{24 - ?}{15}; \quad \frac{24^3 + 2}{12}; \quad \frac{25^3 + 1}{15};$$

$$\frac{24^2 + 4}{0} \text{ (in this specimen the rostrum is abnormal, quite}$$

straight, longer than the carapace and than the scaphocerites, whereas the proximal row of teeth reaches to the end of the antennular peduncles; the teeth of the lower edge are wanting).

$$\frac{27^3 + ?}{\text{probably 16 or 17}} \text{ (the first two or three teeth of the lower}$$

margin are grown together, the tip is broken off and the proximal row of teeth reaches beyond the scaphocerites).

In these specimens the usual number of proximal teeth of the upper margin proves therefore to vary from 20 to 24 and two or three are placed on the carapace. In four specimens one observes an isolated tooth between the proximal row and the subapical tooth, in one case even two isolated teeth are observed.

Of 16 specimens, in which the tip of the rostrum is well preserved 13 are armed with a single subapical tooth, in 2 specimens two are observed and in 1 even four, but the latter specimen is apparently abnormal, because the lower margin carries no teeth at all. In the specimens the rostrum of which is not injured, the number of teeth of the lower margin varies from 11 to 20, there being ordinarily 11, 14, 15 or 16 teeth present. The rostrum commonly extends beyond the scaphocerites, appearing a little longer than the rest of the carapace. The proportion between the length of the unarmed terminal part of the upper edge and that of the proximal row of teeth is very variable; sometimes, as in the specimen figured by Roux, the proximal row appears little more than once and a half as long as the unarmed terminal part (Table A, Nos. 5—8), in other cases the unarmed part is shorter and in No. 4 it measures barely one-third the length of the proximal row.

Though the carpus of the 1st pair of legs appears usually twice or more than twice as long as broad, it presents sometimes a stouter shape, as in No. 5 of the Table; in such specimens the carpus has exactly the same shape as in some individuals of the var.

<sup>1</sup> In each formula near the number of proximal teeth a smaller type indicates how many teeth are placed on the carapace.



*longirostris* from Oran, which variety may, however, still be distinguished by the more slender dactyli of the three posterior legs and by the much smaller eggs. The fingers of the 1st pair of legs are about once and a half as long as the palm, and those of the 2nd pair are also less than twice as long as the palm.

The ischium of the three posterior legs is unarmed. The meropodite of the 3rd pair of legs is armed with three stout spines, the first placed at the level of the proximal third part of the upper margin; the third is situated near the distal extremity, the second midway between the two others. Carpus of the three posterior legs with a similar spine near the distal extremity. The meropodites of the 5th pair of legs carry two spines, like those of the third pair, 0.24 mm. long; the first is placed immediately beyond the middle, the second near the distal extremity.

The dactylus of the 3rd pair is usually armed with 8 or 9 spines the terminal claw included, in the largest specimen (No. 1) it carried 10 spines and in another (No. 8) I observed even 12; in a specimen 20 mm. long, on the contrary, the dactylus presented only 7 spines; their number appears, therefore, to be rather variable. The dactyli of the 5th legs are armed with 40—50 spinules.

The eggs (fig. 1b) are *few in number but large*, larger than in all the other varieties except the var. *paucipara*, being 0.7—0.86 mm. long and 0.42—0.5 mm. broad. The size of the eggs is not only variable in different individuals, but those of one and the same specimen present slight differences as regards their length and breadth. So, *e.g.*, the ova of the female No. 3 presented the following measurements: 0.7 mm.  $\times$  0.42 mm.; 0.7 mm.  $\times$  0.43 mm.; 0.7 mm.  $\times$  0.44 mm.; 0.71 mm.  $\times$  0.42 mm.; 0.73 mm.  $\times$  0.44 mm.; 0.74 mm.  $\times$  0.44 mm. Of the female No. 5, however, the measurements were as follows: 0.8 mm.  $\times$  0.47 mm.; 0.82 mm.  $\times$  0.47 mm.; 0.84 mm.  $\times$  0.49 mm.; 0.86 mm.  $\times$  0.48 mm.

The largest specimen, received from Capt. Flower, is a female with eggs, 29 mm. long.

The two specimens from Lake Victoria Nyanza (compare Table B) differ from the preceding by the dactyli of the three posterior legs; these joints show a *slenderer* shape, somewhat as in the var. *gracilipes* from Celebes, as is proved by comparing the two Tables A and B. In the ova-bearing female, 27 mm. long, the dactylus of the 3rd pair (fig. 2) is armed with 10 spines, in the other with 11; the dactyli of the 5th pair (fig. 2a) are armed with 49 and 50 spinules respectively. In the female 27 mm. long the ischium of the 3rd legs is unarmed, the meropodite carries three spines, 0.21 mm. long, the 2nd spine is placed a little nearer to the proximal than to the distal extremity of the joint, the 1st just midway between the proximal extremity and the 2nd spine, the 3rd near the distal extremity. In the other specimen, however, the meropodite of the 3rd legs presented four spines, the 2nd somewhat nearer to the proximal than to the distal extremity, the 3rd just beyond the 2nd, the 1st midway between the 3rd and the proximal extremity, the 4th near the far end of the joint. The eggs (fig. 2b)

of the female No. 1 are a little smaller than those of the typical form, being 0.62—0.7 mm. long and 0.38—0.4 mm. broad; the measurements of nine eggs are as follows: 0.62 mm.  $\times$  0.38 mm.; 0.62 mm.  $\times$  0.39 mm.; 0.62 mm.  $\times$  0.4 mm.; 0.63 mm.  $\times$  0.38 mm.; 0.64 mm.  $\times$  0.39 mm.; 0.65 mm.  $\times$  0.4 mm.; 0.66 mm.  $\times$  0.38 mm.; 0.68 mm.  $\times$  0.4 mm. and 0.7 mm.  $\times$  0.39 mm.

The measurements of these eggs agree with those indicated by Dr. Calman (*l.c.*) for specimens from the same Lake Victoria Nyanza; also as regards the measurements of the 1st legs, his specimens agree with those of Table B, but the dactyli of the three posterior legs are apparently a little shorter in Calman's specimens.

## 2. *Caridina nilotica* (Roux), var. *natalensis*, nov

### TABLE C.

(Plate xx, figs. 3, 3a, 3b.)

Prof. Max Weber, in his quoted paper on the freshwater fauna of South Africa, referred numerous specimens collected by him in the rivers of Natal, partly to the typical form of *Car. wyckii* (Hicks.), partly to a new variety *paucipara*. A close examination of three adult ova-bearing females from the river Umgeni,—co-types received from him,—proved, however, that they only differ from the typical species, inhabiting Egypt, by the much smaller size of the eggs, whereas they fully agree with it as regards the measurements of the thoracic legs (compare Table C with Table A).

According to Max Weber the dactyli of the 3rd pair should measure  $\frac{1}{6}$ , those of the 5th  $\frac{1}{5}$ , of the length of the propodites; in the three co-types, however, measured on Table C, the dactyli appear distinctly longer. But even when supposing that the dactyli are in other specimens indeed as short as indicated by Prof. Weber, there are apparently still other differences between this Natal variety and the var. *brachydactyla*, nov., from Celebes. The fingers of the 1st legs are in the females from the river Umgeni about once and a half as long as the palm, but in the var. *brachydactyla*<sup>1</sup> twice or more than twice as long; the fingers of the 2nd legs appear also comparatively longer in the var. *brachydactyla* than in the var. *natalensis*. The dactyli of the three posterior legs show a still stouter shape in the Indian variety, and those of the 3rd pair carry only six or seven spines, the terminal claw included, but in the var. *natalensis*, though sometimes seven, also often eight or nine, as was already indicated by Max Weber.

The ischium of the three posterior legs appears unarmed in the females from the river Umgeni. The meropodite of the 3rd legs is armed with three spines, the 1st just or nearly in the middle of the joint, the 3rd near the distal extremity and the 2nd midway between the 1st and the 3rd, or a little nearer to the 2nd. The

<sup>1</sup> Prof. Weber did compare, of course, his Natal specimens with the material described by me in 1892 (*l.c.*); the "typical form" of *Car. wyckii* appears now as the var. *brachydactyla*.

carpus has also a spine near the far end. The meropodite of the 5th legs has but one spine near the distal extremity, there is also a spine on the carpus near the far end, and one observes five small spinules between this spine and the proximal extremity of this joint.

The ova are 0.42—0.48 mm. long and 0.24—0.295 mm. broad, presenting the same size as those of the var. *bengalensis* and of the var. *brachydactyla*. The measurements of ten eggs are as follows: 0.42 × 0.27 mm.; 0.42 × 0.29 mm.; 0.43 × 0.26 mm.; 0.43 × 0.28 mm.; 0.44 × 0.24 mm.; 0.44 × 0.27 mm. (two eggs); 0.44 × 0.29 mm.; 0.455 × 0.285 mm.; 0.46 × 0.295 mm.

The specimens from the Lake Nyasa, described by Dr. Calman (*l.c.*, p. 190), are probably to be referred to this variety.

3. *Caridina nilotica* (Roux), var. *paucipara*, M. Weber.

TABLE D.

(Plate xx, figs. 4, 4a, 4b.)

*Caridina wyckii*, Hickson, var. *paucipara*, Max Weber, *l.c.*, p. 168.

This variety, which inhabits the rivers Umhloti and Umhlasine, and together with the var. *natalensis* the river Umbilo, all situated in Natal, differs from the typical form of Egypt (1) by the *slen-derer* dactyli of the 5th legs, which dactyli are armed with 60—74 spinules instead of 40—50; (2) by *somewhat larger* eggs; and (3) perhaps also by the rostrum. The teeth on the upper edge should be, according to Max Weber, 11—20 in number, less, therefore, than in the Egyptian species; in two of the five co-types the measurements of which are given in Table D the rostrum carries one subapical tooth, in two others this tooth is wanting altogether, in the fifth specimen the tip of the rostrum is injured. The unarmed terminal part is described as being somewhat shorter or just as long as the toothed part of the upper margin; in No. 2 of Table D the unarmed part appears even a trifle longer than the row of teeth, in No. 1 it is just as long, and in two other specimens the toothed part appears once and a half as long as the unarmed one. As regards the number of teeth on the lower margin (12—18) this variety agrees with the typical form.

When the measurements of the legs given in Table D are compared with those of the Egyptian form in Table A, one observes a close resemblance except only in the *proportion between length and breadth* of the dactyli of the 5th pair; in the *paucipara* specimens this proportion varies between 4.6 and 6.2, in the typical form, however, between 4 and 4.6. It ought, however, to be remarked that in some specimens of both varieties the same number (4.6) sometimes occurs, and in these individuals the dactyli present just the same form. In the egg-bearing female No. 1 the ischium of the 3rd legs is armed with a spine near the far end of its lower margin; the meropodite carries three spines, the 2nd somewhat nearer to the distal extremity than to the proximal, the 1st midway between the 2nd and the

proximal extremity, the 3rd near the far end. Carpus with a spine near the distal extremity. The ischium of the 5th legs is unarmed, the meropodite carries two spines, the 1st nearer to the distal than to the proximal extremity, the 2nd near the distal end. Carpus also with a spine near the distal extremity. Another co-type (No. 4) agrees as regards the armature of ischium and meropodite with the preceding specimen.

According to Weber's description the dactylus of the 3rd and 4th pairs should measure about  $\frac{1}{5}$ , that of the 5th  $\frac{1}{4}$  of the propodite: in the co-types measured on Table D, these dactyli appear a little longer.

The eggs (fig. 4b) are few in number and *the largest* of all the other varieties: they are 0.96—1.06 mm. long and 0.55—0.67 mm. broad. Nine eggs of No. 1 presented the following measurements: 0.96 × 0.6 mm.; 0.97 × 0.62 mm.; 0.98 × 0.62 mm.; 0.98 × 0.67 mm.; 1 × 0.62 mm.; 1.02 × 0.62 mm.; 1.02 × 0.63 mm.; 1.02 × 0.64 mm.; 1.05 × 0.6 mm. Four eggs of female No. 3 presented the following measurements: 1.1 × 0.64 mm.; 1.04 × 0.64 mm.; 1.04 × 0.65 mm.; 1.06 × 0.62 mm.; and the measurements, finally, of four eggs of No. 4 were 0.96 × 0.55 mm.; 0.97 × 0.58 mm.; 0.98 × 0.59 mm. and 1 × 0.58 mm.

#### 4. *Caridina nilotica* (Roux), var. *longirostris*, H. M. Edw.

TABLE E

(Plate xx, figs. 5, 5a, 5b.)

*Caridina longirostris*, H. Milne Edwards, Hist. Nat. Crust., ii, 1837, p. 363; de Man, *l.c.*, 1892, p. 396, tab. xxiv, fig. 29l, 29m, 29 mm; Bouvier, *l.c.*, 1905, p. 78.

The 20 specimens, co-types, of *Car. longirostris* from the river Macta, Oran, that are lying before me are the same that were examined and figured by me in 1892. Ten have been measured (Table E). This form proved to be *quite different* from the Egyptian typical species; it may at once be distinguished by *its much smaller eggs* (fig. 5b), which are as small as those of the varieties *gracilipes*, de M., and *brachydactyla*, de M., from Celebes, being 0.33—0.39 mm. long and 0.21—0.26 mm. broad. So, *e.g.*, five eggs of the female No. 2, which was 18.5 mm. long, presented the following measurements: 0.35 × 0.21 mm.; 0.38 × 0.24 mm.; 0.38 × 0.25 mm.; 0.38 × 0.26 mm.; 0.39 × 0.23 mm.; and five eggs of the female No. 7, 16.5 mm. long, the following: 0.33 × 0.23 mm.; 0.34 × 0.23 mm.; 0.36 × 0.23 mm.; 0.36 × 0.24 mm.; 0.37 × 0.25 mm.

The toothing-formulæ of the rostrum of three specimens that are not in the Table are as follows:—

$$\frac{15^1 + 1}{13}; \frac{18^2 + 1}{14}; \frac{19^2 + 1}{15};$$

and in these specimens the proportion between the length of the

toothed part and that of the terminal unarmed part of the upper margin is respectively expressed by the numbers 1·38, 2 and 1·4. Besides one subapical tooth, the upper edge is armed with 14—21 teeth, the lower with 11—17. On an average the toothed part of the upper edge appears only once and a half as long as the terminal unarmed part, but in the typical form from the Nile the unarmed part is usually *shorter*, measuring sometimes even barely one-third of the toothed part (Table A, No. 4). My contention (*l.c.*, 1892, p. 396) that all the upper teeth are placed on the rostrum proper, proved to be erroneous, for one or two are placed on the carapace behind the orbital margin. This variety is, however, also distinguished by the thoracic legs. The carpus of the 1st legs appears usually *broader* in proportion to its length than in the typical form of Egypt and than in the other varieties, except the var. *wyckii*, Hicks., and the var. *minahassa*, de M. The average number, indeed, indicating the proportion between length and breadth of the carpus is for the eight measured specimens from the river Macta 1·64, but for the ten of the typical form from Cairo 2; the carpus of the var. *longirostris* appears therefore *on the average once and a half as long as broad*. As is proved by the measurements, the shape of the carpus of the 2nd legs is *very variable*: in some specimens, indeed, this joint is not quite four times, but in other cases almost five times as long as broad.

The dactyli of the three posterior legs are always *a little longer than one-fourth of the propodite*, nearly as in the Egyptian form, but they are *a little slenderer*; those of the 3rd pair are armed with 7—10 spines, the terminal claw included, those of the 5th with 35—40. The ischium of the 3rd legs carries a spine in the middle, the meropodite of these legs is armed with 3 spines, the 2nd about in the middle, the 1st midway between the 2nd and the proximal extremity, the 3rd near the distal end. Carpus with a spine near the far end and with two smaller spinules between this spine and the proximal extremity. The meropodite of the 5th legs carries a spine just in the middle and one near the distal extremity, while one also observes a spine near the distal end of the carpus.

The var. *longirostris* attains a length of 19 mm., its size being smaller than that of the typical form.

5. *Caridina nilotica* (Roux), var. *bengalensis*, nov.

TABLE F.

(Plate xx, figs. 6, 6a, 6b.)

*Caridina wyckii* (Hickson), Henderson, "A Contribution to Indian Carcinology," 1893, p. 434 (Trans. Linnean Soc. Zool., Ser. 2, vol. v); Nobili, Boll. Mus. Zool. Torino, xviii, No. 452, 1903, p. 6.

The 191 specimens enumerated above and collected in brackish ponds at Port Canning and at Dhappa, near Calcutta, apparently belong to a new variety, different from those living in Africa as also from the varieties that have been observed on the islands of the Indian Archipelago. This new variety differs from

the typical form of *Car. nilotica* of Egypt by the *slenderer* dactyli of the three posterior legs and by the *much smaller* eggs; it presents a greater resemblance to the var. *gracilipes*, de M., from Celebes.

The examination of 61 specimens, mostly adult or egg-bearing, from Port Canning, proved the following: *The usual number of teeth in the proximal series of the upper margin varies between 20 and 24*; in ten specimens 24 teeth were observed, in nine 23, in nine 22, in ten 21 and in eight 20; in two specimens the proximal row consisted of 25 teeth, in three of 26, in three of 27, in one of 29; in only two individuals were 19 teeth and in only one (very young) specimen were 17 teeth observed. The rostrum usually extends slightly beyond the antennal scales, or it appears just as long, rarely is it a little shorter. In all the specimens the proximal row of teeth appears *considerably longer* than the terminal unarmed part and the proportion between the length of the latter and that of the proximal row of teeth is as 1 : 2—4·5. Whereas in the adult ova-bearing female (No. 1 of Table F) 28 mm. in length, the proximal row of teeth is only twice as long as the terminal unarmed part, it is 4 or 5 times as long in a quite young specimen (No. 15) 12·5 mm. in length, and, as is shown by the Table, the other specimens present all possible intermediate proportions. Usually two teeth are placed on the carapace, often, however, three and in one specimen four teeth are placed on the carapace. One observes one subapical tooth as often as two; of the 61 specimens 24 carried one subapical tooth, in 31 two subapical teeth were found, in 2 three and in 1 specimen even four (compare the toothing-formulae). In some specimens one or two isolated teeth occur on the unarmed terminal part of the upper edge between the proximal row and the subapical tooth: of the 61 examined specimens, 13 presented one isolated tooth and in one case two existed. The usual number of teeth on the lower margin varies between 11 and 14: of the 61 specimens in sixteen the lower margin was armed with 11 teeth, in eleven with 12, in eight with 13, in ten with 14, in two with 15, in two with 16, in one with 17, in five with 10, in three with 8 and in one with 6. One of the specimens in which the lower margin is armed with 8 teeth and also that with 6 are adult ova-bearing females.

The largest specimen from Dhappa (26·5 mm. long) differs a little from the preceding. The rostrum projects with one-third of its length beyond the antennal scales, *i.e.*, farther than in the Port Canning specimens; it is  $\frac{21^1 + 1}{13}$  dentate and the two foremost teeth of the upper margin are farther distant from each other than the rest. In this specimen the proximal row of teeth is but 1·8 times as long as the terminal unarmed part.

In Table F the toothing-formulae of 16 specimens are indicated; the formula—

$$\frac{17^2 + 1 + 1}{6}$$

is that of an ova-bearing female, 16.5 mm. long, the rostrum of which is slightly shorter than the scaphocerites and than the carapace; and the formulæ of 45 other specimens, all from Port Canning, are as follows:—

$$\frac{19 + 1 + 2}{11}, \text{ one specimen.}$$

$$\frac{19^2 + 1}{11}, \quad , \quad , \quad ,$$

$$\frac{20^2 + 1}{8}, \quad , \quad , \quad ,$$

$$\frac{20^2 + 3}{10}, \quad , \quad , \quad ,$$

$$\frac{20^2 + 2}{11}, \quad , \quad , \quad ,$$

$$\frac{20^2 + 1}{13}, \quad , \quad , \quad ,$$

$$\frac{20^4 + 1}{13}, \quad , \quad , \quad ,$$

$$\frac{20^2 + 1 + 1}{12}, \quad , \quad , \quad ,$$

$$\frac{20^3 + 1 + 2}{12}, \quad , \quad , \quad ,$$

$$\frac{21^3 + 2}{8}, \text{ a female with eggs.}$$

$$\frac{21^2 + 2}{10}, \text{ one specimen.}$$

$$\frac{21^2 + 1}{11}, \text{ two specimens.}$$

$$\frac{21^2 + 2}{12}, \text{ one specimen.}$$

$$\frac{21 + 3}{13}, \quad , \quad , \quad ,$$

$$\frac{21^3 + 1 + 1}{14}, \text{ one } , ,$$

$$\frac{22^2 + 1}{11}, \quad , \quad , \quad ,$$

$$\frac{22^3 + 1}{11}, \text{ one egg-bearing female, } \\ 15.5 \text{ mm. long.}$$

$$\frac{22^3 + 1 + 1}{11}, \text{ two specimens.}$$

$$\frac{22^2 + 2}{11}, \text{ one specimen.}$$

$$\frac{22^3 + 2}{12}, \quad , \quad , \quad ,$$

$$\frac{27^3 + 1}{14}, \quad , \quad , \quad ,$$

$$\frac{22^2 + 1 + 2}{13}, \text{ one specimen.}$$

$$\frac{22^3 + 2 + 1}{12}, \quad , \quad , \quad ,$$

$$\frac{23 + 2}{8}, \quad , \quad , \quad ,$$

$$\frac{23^3 + 2}{10}, \quad , \quad , \quad ,$$

$$\frac{23^2 + 2}{12}, \text{ two specimens.}$$

$$\frac{23^2 + 1}{14}, \text{ one specimen.}$$

$$\frac{23^4 + 2}{14}, \quad , \quad , \quad ,$$

$$\frac{23^3 + 1 + ?}{14}, \text{ one } , ,$$

$$\frac{23^2 + 1 + 2}{11}, \quad , \quad , \quad ,$$

$$\frac{24^2 + 1}{10}, \quad , \quad , \quad ,$$

$$\frac{24^3 + 2}{10}, \quad , \quad , \quad ,$$

$$\frac{24^3 + 2}{12}, \quad , \quad , \quad ,$$

$$\frac{24^4 + 1}{12}, \quad , \quad , \quad ,$$

$$\frac{24^3 + 2}{13}, \quad , \quad , \quad ,$$

$$\frac{24 + 1 + 2}{13}, \quad , \quad , \quad ,$$

$$\frac{24 + 1 + 4}{14}, \quad , \quad , \quad ,$$

$$\frac{25^3 + 1}{11}, \quad , \quad , \quad ,$$

$$\frac{26^3 + 1}{14}, \quad , \quad , \quad ,$$

$$\frac{26^3 + 2}{16}, \quad , \quad , \quad ,$$

$$\frac{27^4 + 2}{12}, \quad , \quad , \quad ,$$

$$\frac{29^2 + 1 + 2}{15}, \quad , \quad , \quad ,$$

According to my original description in Max Weber's *Zoolog. Ergebn. einer Reise in Niederl. Ost-Indien*, ii, 1892, p. 393, pl. xxiii, figs. 29 and 29e, according to Schenkel (*Beitrag z. Kenntniss der Dekapoden-fauna von Celebes*, 1902, p. 498) and also according to Bouvier (*l.c.*, 1905, p. 73), the rostrum of the var. *gracilipes* is characterised (1) by the proximal row of the upper edge consisting of 12—20 teeth, the usual number being 15—17 (de Man); (2) by the occurrence, usually, of one subapical tooth, rarely two; (3) by the unarmed terminal part being longer than the proximal row, or just as long, or rarely shorter, but in the latter case the proximal row of teeth is no more than twice as long as the unarmed part. Schenkel, indeed, remarks about the rostrum: "meist ungefähr die Hälfte, seltener nur  $\frac{1}{3}$  des Oberrandes zahnlos." In a single specimen from the river Bonéa on the island of Saleyer the upper margin presented 24 teeth (de Man, *l.c.*, 1892, p. 395), but this is, no doubt, an exceptional case.

The upper surface of the telson carries four pairs of spinules, in some specimens five spinules were observed on one side and four on the other; the telson ends posteriorly in a very short tooth, 0.06 mm. long, whereas the hinder edge itself, *i.e.*, the linear distance between the outer angles, is 0.35 mm. broad; at either side of the median tooth four spines are inserted, the first of which, at the outer angle, is the shortest of all—0.12 mm. long; the next spine is the longest—0.33 mm.; the third and the fourth are subequal, the third being 0.22 mm. long, the fourth, contiguous to the median tooth, 0.2 mm. The telson of typical specimens of the var. *gracilipes*, de M., from Maros, Celebes, which are lying before me, fully agrees with that of the Bengal variety.

External maxillipeds reaching to the end of the antennular peduncle.

The legs of the 1st and 2nd pair agree with those of the typical form from Egypt and also with those of the var. *gracilipes*. The carpus of the 2nd legs presents a rather variable form: sometimes (No. 1) it is very slender, as in the var. *gracilipes*, but in other specimens, also adult, its shape is as stout as in the var. *longirostris* from Oran (egg-bearing female No. 3).

The dactylus of the 3rd pair of legs (fig. 6), which is armed with 8—10 spines, the terminal claw included, usually presents the same slender shape as in the var. *gracilipes*, it being 4 or more than 4 times as long as broad; rarely, however, has the dactylus the same stout shape as in the typical *Car. nilotica* from Egypt, so, *e.g.*, in the egg-bearing female No. 7, the dactylus of which is 3.8 times as long as broad. The meropodites of the 3rd legs are, in the adult female, No. 1, ten times as long as broad and armed with three stout spines of equal length (0.26—0.27 mm.); the first is inserted a little nearer to the proximal than to the distal extremity, the second is as far distant from the distal extremity as the first from the proximal, and the third is placed close to the distal extremity. A similar spine occurs near the middle of the ischium and another near the distal end of the lower margin of the carpus.



The meropodites of the 5th pair—nine times as long as broad—are armed with one spine just beyond the middle and another near the distal extremity; also a spine near the distal end of the carpus. The dactyli, which are armed with 45—55 spinules, have the same slender shape as in the var. *gracilipes*, being five or more than five times as long as broad.

The eggs (fig. 6b) are a little larger than those of the var. *gracilipes*; they are usually 0.45 or 0.46 mm. long and 0.28 mm. or 0.3 mm. broad, the length varying between 0.42 mm. and 0.49 mm., the breadth between 0.25 mm. and 0.3 mm. Females (15.5 mm. long) gathered in December in the brackish ponds of Port Canning are already provided with eggs which are of just the same size as those of the largest specimens, as, e.g., those of the female (28 mm. long) collected in November.

This variety has also been observed by Henderson at Madras and by Nobili at Pondicherry.

#### 6. *Caridina nilotica* (Roux), var. *wyckii* (Hickson).

Dr. Calman (*l.c.*, 1907, p. 190) has pointed out, as was already made probable by Prof. Bouvier, that the species described by Hickson (*l.c.*) as *Atya wyckii*, has the first carpus exactly as in the types of *Car. longirostris*, H. M. Edw., and he adds that specimens received from Prof. Hickson agree very closely with the var. *minahassa* described by me, differing chiefly in the shorter dactylus of the three posterior legs, that of the 4th pair being less than one-fifth, and that of the 5th pair one-fourth of the corresponding propodus. Hickson's species, which was discovered in Lake Tondano, situated also in that mountain district of Minahassa, Celebes, thus proves to be a proper variety distinguished from the var. *minahassa*, de M., as from the var. *longirostris*, H. M. Edw., by the short dactyli of the three posterior legs. Unfortunately neither Hickson nor Calman indicate the size of the eggs. Hickson's variety is not lying before me, so that as regards the other characters of this form I must refer to his paper.

#### 7. *Caridina nilotica* (Roux), var. *brachydactyla* nov.

##### TABLE G.

(Plate xx, figs. 8 a—c.)

Synon.: *Caridina wyckii*, de Man, *l.c.*, 1892, pp. 386—393, tab. xxiv, fig. 29f, 29g, 29i, 29ii, 29k, 29cc, 29dd (typical form).

The preceding remarks about the var. *wyckii* (Hickson) prove at once that that form which I considered in 1892 (*l.c.*) to be the typical form of *Car. wyckii*, is, indeed, quite distinct, differing chiefly by the more slender carpus of the 1st pair of legs. This carpus, indeed, appears 2.1—2.5 times as long as broad, presenting the same form as in the typical *Car. nilotica* from the Nile. This variety, which has been observed on the islands of Celebes, Saleyer and Flores, may henceforth be known under the name of *brachydactyla*.

Though it has been fully described in my work of 1892, I wish to add the following: In this work, p. 390, the fingers of the first legs are said to be about once and a half as long as the palm; this observation, probably made by means of a feeble magnifying-glass, proved to be erroneous. Four adult ova-bearing females, co-types of the specimens described in 1892 and taken out of Prof. Weber's collection, have now been exactly measured under the microscope, (Table G): the fingers of the 1st pair now appear to be 2—2.5 times as long as the palm. The carpus of the 2nd legs appears in some specimens very slender (six times as long as thick distally) (Table G, No. 3), but in other individuals it presents the same form as in the typical *nilotica* from the Nile and as in the var. *longirostris*. The fingers of the 2nd chelæ now prove also to be more than twice as long as the palm.

There is no spine on the ischial joint of the three posterior legs. The meropodites of the 3rd legs are armed with 3 spines; the 2nd spine is placed just beyond the middle, the 1st midway between the 2nd and the proximal extremity of this joint or somewhat nearer to the 2nd spine, the 3rd near the distal extremity. Carpus with a spine near the far end. The dactyli measure about  $\frac{1}{6}$  the length of the propodite.

The meropodites of the 5th legs carry one spine near the distal extremity, as also their carpus; the dactyli are also short, measuring  $\frac{1}{5}$ — $\frac{1}{6}$  the length of the propodite.

Quite characteristic is the *stout shape* of the dactyli of the three posterior legs, though it ought to be remarked that the shape of those of the 3rd legs is somewhat variable (*cf.* Nos. 1 and 4 of Table G).

The eggs are very numerous and small, 0.39—0.44 mm. long and 0.22—0.25 mm. broad, presenting nearly the same size as those of the var. *bengalensis* and *natalensis*. Nine eggs of the female No. 1 from Mbawa, Flores, show the following measurements: 0.39 mm.  $\times$  0.23 mm.; 0.4 mm.  $\times$  0.23 mm.; 0.4  $\times$  0.24 mm.; 0.41  $\times$  0.22 mm.; 0.42  $\times$  0.23 mm.; 0.42  $\times$  0.24 mm.; 0.42  $\times$  0.25 mm.; 0.43  $\times$  0.23 mm.; 0.44  $\times$  0.24 mm.

#### 8. *Caridina nilotica* (Roux), var. *gracilipes*, de M.

##### TABLE H.

(Plate xx, figs. 7, 7a, 7b.)

*Caridina wyckii*, Hickson, var. *gracilipes*, de Man, *l.c.*, 1892, p. 393, tab. xxiv, figs. 29 a—e.

This variety, which inhabits the islands of Celebes and Saleyer, is chiefly characterised by the slender dactyli of the three posterior legs, by the carpus of the 1st legs being twice or a little more than twice as long as broad, by the shape and toothing of the rostrum and by its small eggs, which are usually 0.35 mm. long. Three co-types, adult ova-bearing females, from Maros, Celebes, are measured on Table H. In two of the three the fingers of the 1st chela appear

a little more than once and a half, and those of the 2nd pair 1·8 to 2 times as long as the palm. The dactyli of the 3rd legs, which in two of the three females appear a little shorter, but in the third even a little longer than  $\frac{1}{4}$  of the propodite, are armed with 9 or 10 spines, the terminal claw included, but, according to the original description, they are often armed with 11 or 12 spines.

The specimens referred by Schenkel (*l.c.*, p. 498) to this variety seem partly to belong to another form,—probably to the var. *wyckii* (Hicks.),—because in some of his specimens the carpus presented the same shape as in the var. *longirostris*.

The var. *gracilipes* is most closely related to the var. *bengalensis*, from which it seems to differ by the characters of the rostrum and by slightly smaller eggs.

9. *Caridina nilotica* (Roux), var. *minahassa*, de M.

TABLE I.

(Plate xx, figs. 9, 9a, 9b.)

*Caridina nilotica* (Roux), var. *minahassa*, de Man, *l.c.*, 1902, p. 895.

Table I is taken from that in the quoted paper, the numbers having been calculated. This variety is *most closely related* to the var. *longirostris*, H. M. Edw., from Oran, but differs (1) *by the much larger size* of its eggs which are 0·55 mm. long, or once and a half as long as those of the variety inhabiting the river Macta; (2) by the dactyli of the third legs being *slightly shorter* in proportion to the length of the propodite (compare Tables E and I). The dactyli of the three posterior legs have the same slender shape as those of the varieties *longirostris* and *gracilipes*, but those of the third pair are armed with 7 or 8 spines, the terminal claw included, whereas those of the fifth pair carry 33—38 spinules as in the African variety.

*Measurements of the typical form of Caridina*

	No. 1	No. 2	No. 3
Length from tip of rostrum to tip of telson in millimetres .. .. .	29	28.5	27.5
Toothing-formula of the rostrum ..	$\frac{23^3 + 1}{20}$	$\frac{19 + 1 + 1 + ?}{16}$	$\frac{19^3 + ?}{11}$
Rostrum longer >, or shorter < than the scaphocerites .. .. .	>	>	>
Rostrum longer >, or shorter < than the carapace .. .. .	>	=	>
Proportion between the length of the tooth- ed and that of the unarmed part of the upper margin .. .. .	2		
Length of carpus .. .. .	1	1	1.02
Breadth of carpus .. .. .	0.54	0.52	0.46
Proportion between length and breadth of carpus .. .. .	1.85	1.92	2.22
Length of chela .. .. .	1.4	1.36	1.3
Breadth of chela .. .. .	0.65	0.63	0.6
Length of fingers .. .. .	0.83	0.79	0.82
Proportion between length of fingers and that of palm .. .. .	1.45	1.39	1.7
Proportion between length and breadth of chela .. .. .	2.15	2.15	2.16
Length of carpus .. .. .	1.76	1.8	1.8
Breadth of carpus at distal extremity ..	0.41	0.42	0.36
Proportion between length and breadth of carpus .. .. .	4.3	4.3	5
Length of chela .. .. .	1.5	1.5	1.45
Breadth of chela .. .. .	0.57	0.59	0.55
Length of fingers .. .. .	0.92	0.88	0.91
Proportion between the length of fingers and that of palm .. .. .	1.6	1.4	1.7
Proportion between length and breadth of chela .. .. .	2.6	2.54	2.6
Length of propodite .. .. .	2.35	2.48	2.48
Breadth of propodite in the middle ..	0.194	0.19	0.18
Proportion between length and breadth of propodite .. .. .	12.1	13	13.8
Length of dactylus .. .. .	0.63	0.6	0.62
Proportion between length of propodite and that of dactylus .. .. .	3.9	4.1	4
Breadth of dactylus .. .. .	0.176	0.16	0.16
Proportion between length and breadth of dactylus .. .. .	3.6	3.75	3.87
Number of spines of dactylus, terminal claw included .. .. .	10	9	9
Length of propodite .. .. .		2.9	
Breadth of propodite in the middle ..		0.19	
Proportion between length and breadth of propodite .. .. .		15	
Length of dactylus .. .. .		0.92	
Proportion between length of propodite and that of dactylus .. .. .		3.26	
Breadth of dactylus .. .. .		0.2	
Proportion between length and breadth of dactylus .. .. .		4.6	
Number of spines of dactylus, terminal claw included .. .. .		43	

*nilotica (Roux) from Cairo, Egypt.*

No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10	REMARKS.
$\frac{27}{20^2 + 1}$ 16	$\frac{26}{21^3 + 1}$ 17	$\frac{26}{21^3 + 1 + 1}$ 16	$\frac{25.5}{18^3 + 1}$ 15 or 16	$\frac{23.5}{20 + 1}$ 15	$\frac{20}{22^3 + 1}$ 11	$\frac{17.5}{22 + ?}$ 14	No. 1, No. 3 and No. 5 are ova-bearing females. In specimen No. 2 the unarmed part of the upper margin is shorter than the toothed part; in No. 3 and No. 10 the tip of the rostrum is injured.
>	>		>	>	>	>	
>	>		>	>	>	>	
3.1 1 0.49	1.83 0.92 0.51	1.68 0.94 0.46	1.65 1 0.52	1.86 0.9 0.36	2.46 0.78 0.36	0.65 0.29	In No. 8 the dactylus of fifth legs is broken at the extremity.
2 1.34 0.59 0.82	1.81 1.28 0.628 0.78	2 1.15 0.59 0.71	1.92 1.25 0.66 0.75	2.5 1.05 0.47 0.68	2.17 1 0.46 0.63	2.2 0.88 0.38 0.56	
1.58	1.56	1.61	1.5	1.84	1.7	1.75	
2.3 1.68 0.38	2 1.64 0.37	2 1.64 0.36	1.9 1.56 0.38	2.23 1.46 0.28	2.17 1.34 0.276	2.3 1.1 0.22	
4.42 1.44 0.53 0.92	4.4 1.4 0.55 0.92	4.55 1.3 0.554 0.8	4.1 1.35 0.56 0.83	5.2 1.15 0.426 0.73	5 1.1 0.435 0.69	5 0.96 0.36 0.64	
1.77	1.91	1.6	1.6	1.74	1.68	2	
2.7 2.3 0.184	2.55 2.14 0.16	2.35 2.18 0.166	2.4 2.12 0.172	2.7 1.94 0.154	2.53 1.75 0.16	2.7 1.5 0.13	
12.5 0.56	13.4 0.56	13.1 0.52	12.3 0.56	12.6 0.55	11 0.49	11.5 0.45	
4.1 0.16	3.8 0.15	4.2 0.14	3.8 0.156	3.53 0.14	3.6 0.14	3.3 0.116	
3.5	3.7	3.71	3.6	3.93	3.5	3.9	
8 2.55 0.186	8 2.56 0.184	8 2.58 0.174	8 2.55 0.18	12 2.52 0.154	7 2.04 0.16	8 1.8 0.13	
13.7 0.74	14 0.8	14.8 0.8	14.2 0.8	16.4	12.7 0.64	14 0.58	
3.44 0.184	3.2 0.2	3.22 0.18	3.2 0.19	0.16	3.2 0.14	3.1 0.13	
4	4	4.4	4.2		4.57	4.5	
44	42	42	46		37	35	

TABLE B.

*Measurements of specimens from the Lake Victoria Nyanza.*

	No. 1	No. 2
Length from tip of rostrum to tip of telson in millimetres .. .. .	27 $17^2 + 1$	22 $21^2 + 1$
Toothing-formula of the rostrum .. .. .	19	17
Rostrum longer >, or shorter < than the scaphocerites	>	>
Rostrum longer >, or shorter < than the carapace ..	>	>
Proportion between the length of the toothed and that of the unarmed part of the upper margin ..	1	3.1
Length of carpus .. .. .	0.88	0.82
Breadth of carpus .. .. .	0.404	0.35
Proportion between length and breadth of carpus ..	2.2	2.34
Length of chela .. .. .	1.1	1
Breadth of chela .. .. .	0.5	0.43
Length of fingers .. .. .	0.68	0.61
Proportion between length of fingers and that of palm	1.62	1.56
Proportion between length and breadth of chela ..	2.2	2.3
Length of carpus .. .. .	1.58	1.38
Breadth of carpus at distal extremity .. .. .	0.306	0.27
Proportion between length and breadth of carpus ..	5.2	5
Length of chela .. .. .	1.22	1.14
Breadth of chela .. .. .	0.446	0.384
Length of fingers .. .. .	0.77	0.72
Proportion between the length of fingers and that of palm .. .. .	1.71	1.7
Proportion between length and breadth of chela ..	2.73	3
Length of propodite .. .. .	2.16	1.8
Breadth of propodite in the middle .. .. .	0.15	0.13
Proportion between length and breadth of propodite	14.4	14
Length of dactylus .. .. .	0.57	0.51
Proportion between length of propodite and that of dactylus .. .. .	3.8	3.53
Breadth of dactylus .. .. .	0.13	0.104
Proportion between length and breadth of dactylus ..	4.4	5
Number of spines of dactylus terminal claw included	10	11
Length of propodite .. .. .	2.42	2.02
Breadth of propodite in the middle .. .. .	0.17	0.14
Proportion between length and breadth of propodite	14.1	14.4
Length of dactylus .. .. .	0.8	0.7
Proportion between length of propodite and that of dactylus .. .. .	3	2.9
Breadth of dactylus .. .. .	0.16	0.14
Proportion between length and breadth of dactylus ..	5	5
Number of spines of dactylus, terminal claw included	50	49

TABLE C.

*Measurements of Caridina nilotica (Roux), var. natalensis nov.*

TABLE D.

*Measurements of Car. nilotica (Roux), var. paucipara, Max Weber.*

No. 1	No. 2	No. 3	No. 1	No. 2	No. 3	No. 4	No. 5	REMARKS.
39 20 <sup>2</sup> + 1	36.5 181 + 1	34 172 + 1	34 133 + 1	33.5 13 + 0	32.5 162 + 0	32 193 + ?	29 16 + 1	
14	16	18	18	14	12	16	20	
>	>	>	>	=	=		>	
>	>	>	>	>	<		>	
1'35	1'04	1'1	1	0'95	1'5	..	1'43	
1'4	1'26	1'22	1'2	1'34	1'26	1'28	1'06	
0'72	0'62	0'56	0'68	0'684	0'64	0'71	0'47	
2	2	2'2	1'76	1'96	2	1'8	2'3	
1'7	1'64	1'5	1'55	1'7	1'56	1'65	1'22	
0'81	0'74	0'73	0'84	0'93	0'78	0'87	0'6	
0'97	1'01	0'85	0'89	0'92	0'86	0'87	0'76	
1'33	1'6	1'31	1'35	1'18	1'23	1'11	1'65	
2'1	2'2	2'1	1'84	1'83	2	1'9	2'1	
2'3	2'3	2'1	2'36	2'4	2'2	2'34	1'9	
0'5	0'47	0'45	0'51	0'49	0'47	0'48	0'37	
4'6	5	4'66	4'63	5	4'7	5	5'1	
1'75	1'76	1'64	1'8	1'9	1'7	1'75	1'44	
0'67	0'68	0'64	0'74	0'76	0'71	0'72	0'54	
1'08	1'12	1'04	1'19	1'25	1'07	1'05	0'98	
1'6	1'75	1'73	1'95	1'9	1'9	1'5	2'1	
2'6	2'6	2'5	2'43	2'5	2'4	2'43	2'66	
3'1	2'96	2'85	2'95	3	3'08	2'85	2'35	
0'226	0'208	0'19	0'22	0'23	0'22	0'224	0'224	
13'7	14'2	15	13'4	13	14	12'7	10'5	
0'68	0'67	0'63	0'68	0'66	0'72	0'66	0'6	
4'6	4'4	4'5	4'3	4'5	4'3	4'3	3'9	
0'188	0'18	0'18	0'186	0'2	0'188	0'194	0'178	
3'7	3'7	3'5	3'65	3'3	3'8	3'4	3'37	
8	9	7	9	8	8	8	9	
3'7	3'6	3'46	3'7	3'76	3'7	3'66	3'3	
0'216	0'22	0'195	0'244	0'24	0'21	0'238	0'196	
17	16'4	18	15	15'7	18	15'1	16'8	
0'82	0'88	0'82	1'07	1'07	1'18	1'15	0'98	
4'5	4'1	4'22	3'4	3'5	3'1	3'2	3'36	
0'2	0'198	0'186	0'232	0'22	0'19	0'22	0'184	
4'1	4'4	4'4	4'6	4'9	6'2	5'2	5'32	
50	50	46	62	70	72	72	68	

No. 1 of Table B is an ova-bearing female.  
 The three specimens of Table C are ova-bearing females from the river Umgeni, Natal.  
 The five specimens of Table D are from the river Umhlatine, Natal; they are, like those of Table C, co-types from Prof. Weber's collection. No. 1, No. 3 and No. 4 are ova-bearing females; in No. 3 and No. 2 a subapical tooth is wanting, and in No. 4 the rostrum is injured.

Measurements of *Caridina nilotica* (Roux)

	No. 1	No. 2	No. 3	No. 4	No. 5
Length from tip of rostrum to tip of telson in millimetres .. .. .	19 $21^2 + 1$	18.5 $17^2 + 1$	18 $16^2 + 1$	18 $17^1 + 1$	17.5 $15^1 + 1$
Toothed-formula of the rostrum .. .. .	17 slightly >	16 slightly >	12 slightly >	14 >	15 slightly >
Rostrum longer >, or shorter < than the scaphocerites .. .. .	slightly >	slightly <	slightly >	>	>
Rostrum longer >, or shorter < than the carapace .. .. .	>	<	>	>	>
Proportion between the length of the toothed and of the unarmed part of the upper margin	1.65	1.32	1.24	1.26	1.42
Length of carpus .. .. .	0.84	0.82		0.75	0.7
Breadth of carpus .. .. .	0.48	0.54		0.5	0.4
Proportion between length and breadth of carpus .. .. .	1.75	1.52		1.5	1.75
Length of chela .. .. .	1.12	1.2		1.08	1
Breadth of chela .. .. .	0.56	0.67		0.59	0.5
Length of fingers .. .. .	0.66	0.64		0.64	0.68
Proportion between length of fingers and that of palm .. .. .	1.5	1.16		1.46	2.1
Proportion between length and breadth of chela	2	1.8		1.83	2
Length of carpus .. .. .	1.46	1.42			1.32
Breadth of carpus at distal extremity .. .. .	0.335	0.38			0.288
Proportion between length and breadth of carpus	4.36	3.7			4.6
Length of chela .. .. .	1.18	1.18			1.08
Breadth of chela .. .. .	0.5	0.58			0.424
Length of fingers .. .. .	0.78	0.78			0.78
Proportion between the length of fingers and that of palm .. .. .	1.95	1.95			2.6
Proportion between length and breadth of chela	2.36	2			2.55
Length of propodite .. .. .	1.88	1.8	1.82		1.65
Breadth of propodite in the middle .. .. .	0.146	0.15	0.124		0.122
Proportion between length and breadth of propodite .. .. .	13	12	14.7		13.5
Length of dactylus .. .. .	0.51	0.52	0.5		0.47
Proportion between length of propodite and that of dactylus .. .. .	3.7	3.6	3.64		3.5
Breadth of dactylus .. .. .	0.12	0.124	0.11		0.1
Proportion between length and breadth of dactylus .. .. .	4.25	4.2	4.5		4.7
Number of spines of dactylus, terminal claw included .. .. .	8	9	9		8
Length of propodite .. .. .	2.08		1.88	1.84	
Breadth of propodite in the middle .. .. .	0.12		0.115	0.11	
Proportion between length and breadth of propodite .. .. .	17		16.3	16.7	
Length of dactylus .. .. .	0.6		0.55	0.52	
Proportion between length of propodite and that of dactylus .. .. .	3.46		3.4	3.54	
Breadth of dactylus .. .. .	0.12		0.11	0.11	
Proportion between length and breadth of dactylus .. .. .	5		5	4.7	
Number of spines of dactylus, terminal claw included .. .. .	37		35	35	



E.

*var. longirostris*, H. M. Edw.*Measurements of Caridina nilotica (Roux), var.  
brachydactyla nov.*

No. 6	No. 7	No. 8	No. 9	No. 10	No. 1	No. 2	No. 3	No. 4	REMARKS.
I7 16+1 16 slightly > >	I6.5 15+1 16 > slightly >	I6.5 rostrum broken off. 0.8 0.42	16+1 16 > >	I4 16+1 14 > >	3I.5 19+1 13 slightly < slightly <	3I 21+1+2 16 = slightly >	33 26+2 15 < <	29 22+1 15 slightly > slightly >	No. 2 and No. 7 of Table E are ova- bearing females. The four specimens of Table G are all ova-bearing; No. 1 and No. 2 are from Mbawa, Flores; No. 3 and 4 from Palopo, Celebes, all co- types of Max Weber's collec- tion of 1892.
I.25 0.78 0.48	I.18 0.75 0.48	0.8 0.42	I.6	I.44 0.59 0.39	I.9 I.32 0.64	3.3 I.15 0.48	4.4 I.56 0.63	2 I.3 0.54	
I.62 I.1 0.6 0.67	I.56 I.1 0.58 0.64	I.9 I.02 0.5 0.65		I.51 0.91 0.5 0.54	2.1 I.7 0.77 I.14	2.4 I.56 0.61 I.11	2.5 I.94 0.88 I.34	2.4 I.6 0.71 I.1	
I.56 I.83	I.39 I.9 I.34 0.33 4 I.08 0.5 0.7	I.75 2.04 I.38 0.295 4.7 I.1 0.45 0.74		I.5 I.82 I 0.296 3.4 0.92 0.48 0.59	2 2.2 2.18 0.48 4.5 I.74 0.72 I.25	2.5 2.56 I.95 0.4 4.87 I.75 0.6 I.2	2.23 2.2 2.76 0.464 6 2.03 0.76 I.45	2.2 2.25 2.3 0.42 5.5 I.72 0.64 I.18	
	I.15 2.6	2.05 2.44	2 2.1 (4th pair).	I.78 I.9	2.55 2.5	2.2 2.9	2.5 2.7	2.2 2.7	
I.58 0.13	I.78 0.122	I.7 0.118	I.62 0.122	I.36 0.11	3.1 0.224	3.25 0.2	3.4 0.232	3 0.17	
I2.1 0.44	I4.6 0.51	I4.4 0.46	I3.3 0.44	I2.3 0.4	I3.8 0.5	I6.2 0.52	I4.7 0.58	I8.2 0.52	
3.6 0.11	3.5 0.108	3.7 0.096	3.7 0.1	3.4 0.094	6.2 0.186	6.2 0.168	6 0.198	5.8 0.146	
4 8 I.9 0.118	4.7 10 I.84 0.102	4.8 8	4.4 9 I.75 0.106	42 7 I.44 0.098	2.7 7 4.1 0.24	3.1 6 4.5 0.22	3 6 4.5 0.22	3.5 6 6 0.22	
I6.1 0.54	I8 0.56		I6.3 0.51	I4.7 0.44	I7.1 0.68		20 0.83		
3.5 0.115	3.28 0.102		3.4 0.11	3.27 0.094	6 0.2		5.4 0.22		
4.7 36	5.5 39		4.6 35	4.68 30	3.4 34		3.8 50		

Measurements of *Caridina nilotica* (Roux),

	No. 1	No. 2	No. 3	No. 4	No. 5
Length in millimetres from tip of rostrum to tip of telson .. .. .	28 $20^2 + 2$	25 $22^2 + 1$	23 $21^2 + 2$	23 $24 + 2$	21.5 $27^2 + 1^2$
Toothed-formula of the rostrum .. .. .	11	17	11	14	16 or 17
Rostrum longer >, or shorter < than the scaphocerites .. .. .	slightly >	slightly >	slightly >	>	>
Rostrum longer >, or shorter < than the carapace .. .. .	slightly <	=	slightly >	>	>
Proportion between the length of the toothed and that of the unarmed part of the upper margin .. .. .	2	4.4	3.26	3	3.2
Length of carpus .. .. .	1.06	1.02	0.9	0.85	0.8
Breadth of carpus .. .. .	0.48	0.58	0.46	0.43	0.36
Proportion between length and breadth of carpus .. .. .	2.2	1.8	2	2	2.2
Length of chela .. .. .	1.3	1.34	1.1	1.1	1.06
Breadth of chela .. .. .	0.56	0.7	0.56	0.56	0.5
Length of fingers .. .. .	0.78	0.8	0.67	0.63	0.63
Proportion between length of fingers and that of palm .. .. .	1.5	1.5	1.56	1.34	1.5
Proportion between length and breadth of chela .. .. .	2.3	1.9	2	2	2.1
Length of carpus .. .. .	1.95	1.8	1.5	1.48	1.46
Breadth of carpus at distal extremity .. .. .	0.33	0.38	0.36	0.314	0.26
Proportion between length and breadth of carpus .. .. .	6	4.7	4.2	4.7	5.6
Length of chela .. .. .	1.35	1.34	1.28	1.15	1.1
Breadth of chela .. .. .	0.46	0.56	0.47	0.44	0.38
Length of fingers .. .. .	0.84	0.88	0.86	0.75	0.72
Proportion between length of fingers and that of palm .. .. .	1.65	1.9	2	1.87	1.9
Proportion between length and breadth of chela .. .. .	3	2.4	2.7	2.6	2.9
Length of propodite .. .. .	2.46	2.2	1.96		
Breadth of propodite in the middle .. .. .	0.18	0.166	0.146		
Proportion between length and breadth of propodite .. .. .	13.7	13.2	13.4		
Length of dactylus .. .. .	0.6	0.55	0.5		
Proportion between length of propodite and that of dactylus .. .. .	4.1	4	4		
Breadth of dactylus .. .. .	0.14	0.138	0.12		
Proportion between length and breadth of dactylus .. .. .	4.3	4	4.1		
Number of spines of dactylus, terminal claw included .. .. .	10	9	9		
Length of propodite .. .. .	2.95		2.2	2.28	
Breadth of propodite in the middle .. .. .	0.175		0.126	0.142	
Proportion between length and breadth of propodite .. .. .	17		17	16	
Length of dactylus .. .. .	0.88			0.7	
Proportion between length of propodite and that of dactylus .. .. .	3.35			3.3	
Breadth of dactylus .. .. .	0.16			0.13	
Proportion between length and breadth of dactylus .. .. .	5.5			5.4	
Number of spines of dactylus, terminal claw included .. .. .	54			45	

var. bengalensis nov., from Port Canning.

No. 6	No. 7	No. 8	No. 9	No. 10	No. 11	No. 12	No. 13	No. 14	No. 15	No. 16	REMARKS.
$\frac{20}{23^2+2}$ 11	$\frac{20}{24^3+1}$ 13	$\frac{17.5}{21^3+2}$ 11	$\frac{17}{21+1}$ 11	$\frac{17}{26^2+1+2}$ 14	16	$\frac{16}{25^3+2}$ 14	$\frac{14.75}{24^2+1}$ 15	$\frac{14.5}{21+1}$ 13	$\frac{12.5}{22+2}$ 12	$\frac{10}{17+2}$ 11	
>	=	=	slightly <	>		>	>	slightly >	=	slightly >	
>	slightly <	slightly <	slightly <	>		>	>	>	slightly <	slightly >	
2.6 0.78 0.42	3.3 0.82 0.46	4 0.79 0.44	2.7 0.76 0.39	2 0.55 0.24	0.68 0.41	3.8 0.56 0.26	2.85 0.53 0.22	2.7 0.5 0.22	4.5 0.56 0.35	2.55 0.32 0.16	
1.9 1.06 0.52 0.64	1.8 1.1 0.55 0.6	1.8 1.02 0.54 0.62	1.95 0.95 0.472 0.59	2.3 0.77 0.32 0.49	1.66 0.98 0.5 0.62	2.1 0.75 0.3 0.46	2.4 0.72 0.29 0.455	2.3 0.65 0.3 0.4	1.6 0.8 0.41 0.48	2 0.46 0.204 0.274	
1.52	1.2	1.55	1.6	1.75	1.72	1.6	1.75	1.6	1.5	1.47	
2 1.3 0.3	2 1.46 0.3	1.9 1.33 0.31	2 1.3 0.26	2.4 1.02 0.17	1.96 1.25 0.268	2.5 1 0.18	2.5	2.2 0.88 0.166	1.95 0.98 0.22	2.25 0.55 0.13	
4.3 1.1 0.48 0.72	4.9 1.2 0.45 0.81	4.3 1.05 0.45 0.69	5 1.03 0.37	6 0.85 0.28 0.55	4.7 1 0.42 0.67	5.5 0.82 0.266 0.52		5.3 0.7 0.24 0.46	4.4 0.86 0.33 0.57	4.23 0.51 0.17 0.34	
1.9 2.3 1.76 0.128	2.1 2.7 1.84 0.146	1.9 2.33 1.7 0.13		1.8 3 1.4 0.106	2 2.4 1.55 0.108	1.75 3.1 1.3		1.9 3 1.16 0.094	1.96 2.6 1.24 0.09	2 3 0.76 0.062	
13.7 0.47	12.6 0.47	13 0.5		13.2 0.4	14.3 0.45		15 0.36	12.4 0.33	14 0.36	12 0.226	
3.74 0.108	3.9 0.124	3.4 0.12		3.5 0.088	3.44 0.096		3.33 0.076	3.9 0.08	3.4 0.08	3.36	
4.4 10	3.8 9	4.1 10		4.5 8	4.7 8		4.7 8	4.1 6	4.5 9	6	
	2.06	1.86	1.72	1.8	1.68	1.66		1.4	1.46		
	0.146	0.122	0.125	0.095	0.114	0.094		0.08	0.1		
	14 0.68	15.2 0.62	14 0.6	19 0.54	15 0.56	17.7 0.53		18	14.6 0.48		
	3 0.136	3 0.12	2.87 0.12	3.3 0.095	3 0.1	3.1 0.1		0.086	3 0.09		
	5	5.2	5	5.7	5.6	5.3			5.4		
49	43	47	41	40	41				40		

No. 5, No. 10, Nos. 12-14, Port Canning, January 28-30th, 1906.  
Nos. 1-4, No. 6 and No. 16, Port Canning, November 12th, 1906.  
Nos. 7-9, No. 11 and No. 15, Port Canning, December 8th, 1906.  
Nos. 1-9 and No. 11 are ova-bearing females. The rostrum of No. 5 was injured.

TABLE H.

*Measurements of Caridina nilotica (Roux), var. gracilipes, de M.*

	No. 1	No. 2	No. 3
Length in millimetres from tip of rostrum to tip of telson	28.5 17 <sup>2</sup> + 1	27 20 <sup>2</sup> + 1	13 <sup>2</sup> + 1
Toothing-formula of the rostrum .. .. .	13	17	11 slightly
Rostrum longer >, or shorter < than the scaphocerites..	>	>	>
Rostrum longer >, or shorter than the carapace	=	>	>
Proportion between the length of the toothed and that of the unarmed part of the upper margin .. .. .	1.17	1.6	0.75
Length of carpus .. .. .	1.16	1.1	1.06
Breadth of carpus .. .. .	0.49	0.55	0.48
Proportion between length and breadth of carpus ..	2.37	2	2.2
Length of chela .. .. .	1.36	1.42	1.26
Breadth of chela .. .. .	0.59	0.7	0.6
Length of fingers .. .. .	0.78	0.87	0.8
Proportion between length of fingers and that of palm ..	1.34	1.6	1.74
Proportion between length and breadth of chela ..	2.3	2	2.1
Length of carpus .. .. .		2.14	1.9
Breadth of carpus at distal extremity .. .. .		0.39	0.35
Proportion between length and breadth of carpus ..		5.5	5.4
Length of chela .. .. .		1.5	1.4
Breadth of chela .. .. .		0.59	0.52
Length of fingers .. .. .		0.96	0.94
Proportion between the length of fingers and that of palm		1.8	2
Proportion between length and breadth of chela ..		2.54	2.7 (4th pair).
Length of propodite .. .. .	2.46	2.64	2.4
Breadth of propodite in the middle .. .. .	0.178	0.18	0.15
Proportion between length and breadth of propodite ..	13.8	14.7	16
Length of dactylus .. .. .	0.64	0.61	0.55
Proportion between length of propodite and that of dactylus .. .. .	3.84	4.32	4.4
Breadth of dactylus .. .. .	0.14	0.128	0.13
Proportion between length and breadth of dactylus ..	4.6	4.8	4.2
Number of spines of dactylus, terminal claw included ..	9	10	10
Length of propodite .. .. .	3.1	3.1	2.7
Breadth of propodite in the middle .. .. .	0.178	0.164	0.16
Proportion between length and breadth of propodite ..	17.4	19	17
Length of dactylus .. .. .	0.84	0.82	0.72
Proportion between length of propodite and that of dac- tylus .. .. .	3.7	3.8	3.75
Breadth of dactylus .. .. .	0.156	0.14	0.146
Proportion between length and breadth of dactylus ..	5.4	6	5
Number of spines of dactylus, terminal claw included ..	56	57	46

TABLE I.

*Measurements of Caridina nilotica (Roux), var. minahassa, de M.*

No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10	REMARKS.
0.86	0.84		0.8	0.8		0.72	0.6	0.64	0.6	Nos. 1—3 of Table H co-types of the var. <i>gracilipes</i> , de M., from the river at Maros, Celebes; No. 1 and No. 2 ova-bearing.
0.52	0.49		0.47	0.49		0.48	0.48	0.4	0.35	
1.65	1.71		1.7	1.6		1.5	1.25	1.6	1.7	Nos. 1—10 of Table I co-types of the var. <i>minahassa</i> from the Minahassa (Celebes) (Kükenthal's Collection).
1.18	1.18		1.04	1.1		1.02	1.06	0.92	0.9	
0.62	0.62		0.55	0.6		0.58	0.54	0.49	0.48	
0.68	0.68		0.64	0.6		0.64	0.6	0.56	0.52	
1.36	1.36		1.6	1.2		1.7	1.3	1.6	1.4	
1.9	1.9		1.9	1.8		1.8	2	1.9	1.9	
1.5	1.4		1.3		1.2		1.12	1.12	1.1	
0.35	0.34		0.29		0.32		0.32	0.266	0.25	
4.3	4.1		4.5		3.7		3.5	4.2	4.4	
1.2	1.16		1.04		1.04		1.04	0.92	0.94	
0.56	0.5		0.45		0.51		0.5	0.42	0.43	
0.8	0.74		0.66		0.6		0.6	0.6	0.58	
2	1.76		1.7		1.4		1.4	1.9	1.6	
2.1	2.32		2.3		2		2.1	2.2	2.2	
1.84		1.72	1.66		1.54	1.52	1.6	1.3	1.4	
0.13		0.11	0.115		0.11		0.11	0.1	0.092	
14		16	14.4		14		15	13	15	
0.44		0.42	0.44		0.4	0.38	0.44	0.33	0.35	
4.2		4.1	3.8		3.8	4	3.6	4	4	
0.1		0.09	0.1		0.09	0.08	0.09	0.08	0.08	
4.4		4.6	4.4		4.4	4.7	4.9	4.1	4.4	
	1.96	1.9	1.8			1.76			1.56	
	0.1	0.1	0.1			0.106			0.092	
	19.	19	18			17			17	
	0.56	0.55	0.52			0.51			0.47	
	3.5	3.4	3.5			3.4			3.3	
		0.1	0.1			0.1			0.092	
		5.5	5.2			5.1			5	

Measurements in millimetres of *Caridina propinqua* and *Car. levis*.

	1	2	3	4	5	6	7	8
Length in millimetres from tip of rostrum to tip of telson	20.5		19.5	13.5				
Length of merus .. .. .	0.66	0.64	0.6		0.75	0.78	0.75	
Length of carpus .. .. .	0.88	0.86	0.8		0.83	0.84	0.82	
Breadth of carpus .. .. .	0.335	0.348	0.306		0.326	0.32	0.34	
Proportion between length and breadth of carpus ..	2.6	2.5	2.6		2.54	2.6	2.4	
Length of chela .. .. .	1.1	1.1	1.06		1.04	1.05	1.04	
Breadth of chela .. .. .	0.52	0.46	0.46		0.454	0.4	0.44	
Proportion between length and breadth of chela ..	2.11	2.4	2.3		2.3	2.6	2.4	
Length of fingers .. .. .	0.72	0.7	0.7		0.64	0.64	0.61	
Proportion between length of palm and that of fingers	1.9	1.75	2		1.6	1.56	1.42	
Length of merus .. .. .	0.95	0.94	0.78		1.12	1.1	1.06	
Length of carpus .. .. .	1.5	1.42	1		1.6	1.6	1.52	
Breadth of carpus at distal extremity .. .. .	0.27	0.27	0.23		0.206	0.22	0.24	
Proportion between length and breadth of carpus ..	5.5	5.2	4.4		7.7	7.3	6.3	
Length of chela .. .. .	1.16	1.18	0.96		1.34	1.26	1.28	
Breadth of chela .. .. .	0.42	0.4	0.3		0.285	0.28	0.31	
Proportion between length and breadth of chela ..	2.7	2.95	3.2		4.7	4.5	4	
Length of fingers .. .. .	0.74	0.74	0.63		0.79	0.72	0.72	
Proportion between length of palm and that of fingers	1.76	1.7	1.9		1.44	1.33	1.3	

Length of meropodite ..	1'9	1'82	1'7	1'28	2'06	2	2'06
Breadth of meropodite..	0'22	0'22	0'2	0'162	0'24	0'22	0'235
Proportion between length and breadth of meropodite	8'6	8'3	8'5	8	8'6	9	8'8
Length of propodite ..	1'6	1'4	1'55	1'16; 1'16	1'7	1'6	1'66
Breadth of propodite ..	0'14	0'15	0'13	0'1; 0'1	0'136	0'13	0'132
Proportion between length and breadth of propodite	11'4	9'3	12	11'6; 11'6	12'5	12'3	12'5
Length of dactylus ..	0'46	0'42	0'53	0'4; 0'42	0'5	0'5	0'52
Breadth of dactylus ..	0'11	0'108	0'11	0'08; 0'08	0'116	0'12	0'118
Proportion between length and breadth of dactylus	4'2	4	4'8	5; 5	4'3	4'2	4'4
Proportion between length of propodite and that of dactylus	3'5	3'3	3	2'9; 2'8	3'4	3'2	3'2
Number of spines of dactylus ..	6	5	5	4; 6	9	9	8
Length of meropodite			1'4		1'6		1'58*
Breadth of meropodite...			0'175		0'2		0'204
Proportion between length and breadth of meropodite			8		8		8
Length of propodite ..			1'76		2'06		2'15
Breadth of propodite ..			0'122		0'13		0'12
Proportion between length and breadth of propodite			14'4		16		18
Length of dactylus ..			0'74		0'85		0'92
Breadth of dactylus ..			0'13		0'132		0'12
Proportion between length and breadth of dactylus			5'7		6'44		7'66
Proportion between length of propodite and that of dactylus			2'38		2'4		2'33
Number of spines of dactylus, terminal claw included			48		78		75

Nos. 1—4 *Caridina propinqua*, sp. nov. No. 1 20'5 mm. long; No. 2 about the same length, rostrum broken off; No. 3 19'5 mm. long; No. 4 13'5 mm. long (in No. 4 both legs of third pair are measured). Nos. 5—8 *Car. laevis*, Heller, adult ovigerous specimens.



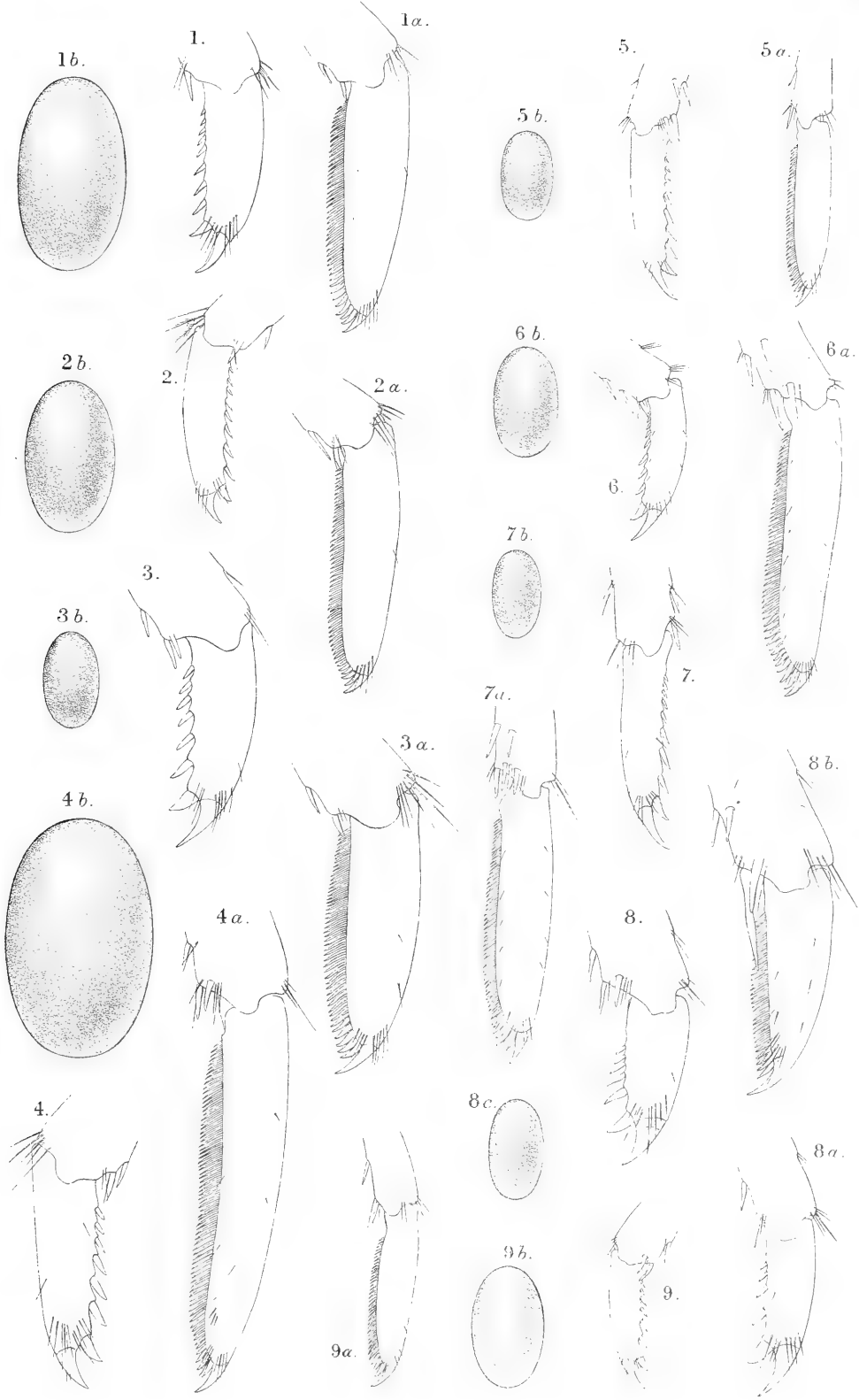




## EXPLANATION OF PLATE XX.

*The dactyli are enlarged 50 times, the eggs 33 times.*

- FIG. 1.—*Caridina nilotica* (Roux), typical form from Cairo, dactylus of third pair of the egg-bearing female (No. 1 of Table A); 1a dactylus of fifth pair of the specimen No. 7; 1b egg, 0.86 mm. long, of the female No. 5.
- „ 2.—*Car. nilotica* (Roux), variety from Lake Victoria Nyanza, dactylus of third pair of the female 27 mm. long, 2a dactylus of fifth pair and 2b egg, 0.67 mm. long, of the same female.
- „ 3.—*Car. nilotica* (Roux), var. *natalensis* nov., dactylus of third pair of the female No. 1 of Table C; 3a dactylus of fifth pair of the same female; 3b egg, 0.42 mm. long, of the female No. 2.
- „ 4.—*Car. nilotica* (Roux), var. *paucipara*, M. Weber, dactylus of third pair; 4a dactylus of fifth pair and 4b egg, 1.04 mm. long, of the female No. 3 of Table D.
- „ 5.—*Car. nilotica* (Roux), var. *longirostris*, H. M. Edw., dactylus of third pair and 5a of fifth pair of the female No. 7 of Table E; 5b egg, 0.39 mm. long, of the female No. 2.
- „ 6.—*Car. nilotica* (Roux), var. *bengalensis* nov., dactylus of third pair of the female No. 6 of Table F; 6a dactylus of fifth pair and 6b egg, 0.47 mm. long, of the female No. 1.
- „ 7.—*Car. nilotica* (Roux), var. *gracilipes*, de Man, dactylus of third pair, 7a of fifth pair and 7b egg, 0.38 mm. long, of the female No. 2 of Table H.
- „ 8.—*Car. nilotica* (Roux), var. *brachydactyla*, nov., dactylus of third pair, 8b of fifth pair and 8c egg, 0.44 mm. long, of the female No. 1 of Table G; 8a dactylus of third pair of the female No. 4.
- „ 9.—*Car. nilotica* (Roux), var. *minahassa*, de Man, dactylus of third pair and 9a of fifth pair of a specimen, 16 mm. long, co-type from Kükenthal's Collection; 9b egg, 0.55 mm. long.





XXIX. DESCRIPTION OF A NEW SPECIES OF  
CHARAXES FROM THE BHUTAN  
FRONTIER.

By G. W. V. DERHE-<sup>4</sup>PHILIPPE.

*Charaxes raidhaka*, sp. nov.

Closely allied to *C. fabius*, Fabricius. Termen of fore wing more oblique, and both termen and dorsum shorter than in *C. fabius*, giving the wing a narrower and more pointed appearance.

*Upper side*.—Fore wing, ground colour a deep velvety black, darker generally than in the allied form; basal area greyish black. Immaculate except for a subterminal series of cream-coloured spots decreasing in size towards the apex; these spots larger and more marked than in *C. fabius*, those at the posterior angle being twice as large as in most examples of the latter. Hind wing, discal band as in *C. fabius*, but generally paler and narrower; subterminal series of light yellow spots complete, terminal markings greenish blue, not yellow.

*Under side*.—Ground colour a purplish grey, appreciably different from the usual ground colour of *C. fabius*. Markings arranged as in the latter, but the discal white bar on the fore wing obsolete and the sinuous black lines less defined. Ochreous red discal and purple submarginal lunular markings on hind wing large and distinct.

In regard to the outline of the fore wings, careful measurements of several males of *C. fabius* from different parts of India show the relative lengths of the costa, termen and dorsum to be in the proportions of 100: 75: 64 or 65; while similar measurements of the new form are in the proportions of 100: 70: 60. The difference in outline, though slight, is distinct.

The species is not represented either in the de Nicéville collection or in the Indian Museum collections; nor is it described in Rothschild's "Monograph on the *Charaxes* and allied genera" (*Novitates Zoologicae*, vols. v, vi and vii). It would appear to approach some of the Malayan forms of the genus; except for the almost unmarked fore wing, the upper side is not unlike that of *C. echo*, Butler, as illustrated and described in the above work.

Expanse 3.16 inches. Described from a single male taken near Jainti on the Raidhak River (Bhutan frontier), 2,000 feet, in June, and now in my collection.



XXX. FIRST REPORT ON THE COLLECTION  
OF CULICIDÆ AND CORETHRIDÆ IN  
THE INDIAN MUSEUM, CALCUTTA, WITH  
DESCRIPTIONS OF NEW GENERA AND  
SPECIES.

By FRED. V. THEOBALD, M.A., etc.

Amongst the first consignment of the large collection of mosquitoes sent me to examine by the Indian Museum, Calcutta, only thirty-seven species were found. Amongst these are three new species of *Stegomyia*; a new variety of *Neomacleaya indica*, Theobald; a new *Leicesteria*; a new *Culex*; a new *Chrysoconops* and two new genera I have called *Brevirhynchus* and *Radioculex*, each of which contains but a single species. Both of these genera are very marked.

An examination of a long series of a *Culex* with banded proboscis has not been critically made, but I am inclined to believe that they all belong to one species, owing to the various gradations seen in it, and that in consequence several of the species coming under the *Culex microannulatus* group, such as *C. vishnui*, etc., will have to be sunk under one of the old names such as *C. sitiens*. The same applies to the genus *Desvoidia*, as the series shows such great variation in colour.

The numbers in brackets refer to the number of specimens in the collection.

SPECIES IN THE COLLECTION.

Family CULICIDÆ.<sup>1</sup>

1. *Anopheles aithenii*, Theobald-James.

A single ♀ and badly damaged ♂. Meenglas, Dooars, Jalpaiguri [*C. Wallich*], 9-viii-07. These are the only other specimens of this *Anopheles* I have seen since those sent me by Capt. James, I.M.S. (*vide Mon. Culicid.*, vol. iii, p. 22, 1903).

2. *Myzomyia rossii*, Giles.

Five specimens taken at light at Calcutta in November; eighteen taken in December at Port Canning, Lower Bengal, and one taken in January at Sylhet, Assam.

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<sup>1</sup> The majority of the Anophelinae in the collection were not sent to Mr. Theobald.—ED., *Rec. Ind. Mus.*

3. *Nyssorhynchus fuliginosus*, Giles.

Calcutta, two taken in November and one at light in December.

4. *Myzorhynchus barbirostris*, Van der Wulp.

Calcutta, one female in December.

5. *Myzorhynchus vanus*, Walker.

Calcutta, one in October, twenty-one in November and ten in December; Port Canning, Lower Bengal.

6. *Toxorhynchites immisericors*, Walker.

Aijal (3,600 ft.), Lushai Hills, Assam, ♀, 24-iv-04.

7. *Mucidus scataphagoides*, Theobald.

Bauria, Bengal [*D. A. Tyrie*], 17-viii-07 (one ♀); Damukdia Ghat, E. Bengal, 22-viii-07 (one ♀).

\*8. *Stegomyia tripunctata*, sp. nov.

Head black with three silvery white spots, one median in front and one on each side, proboscis and palpi black.

Thorax black with dull bronzy scales; prothoracic lobes white scaled.

Abdomen black with basal lateral white spots which meet on the dorsum on the 5th and 6th segments to form basal bands.

Legs black, unbanded.

♀. Head black, clothed with flat black scales except for a snowy white area in front between the eyes, and a patch on each side of somewhat less shiny hue, chætæ black, two projecting forwards between the eyes, two curving downwards over the basal segments of the antennæ; eyes coppery and golden; clypeus brown, shiny; proboscis thin and black; palpi short, black scaled and with black chætæ; antennæ dark brown, verticillate areas pale, base of second segment testaceous, basal segment black, shiny, with some small curved black chætæ.

Thorax shiny black, with rather large narrow-curved bronzy scales and some paler areas here and there, prothoracic lobes covered with flat silvery white scales, scutellum testaceous with flat black scales, metanotum black, pleuræ black with silvery white flat scales forming a long patch and two spots.

Abdomen narrow, black scaled, with basal white lateral patches, which meet on the fifth and sixth segments to form basal white bands, border-bristles small and pale.

Legs deep brown with bronzy reflections, venter of femora and coxæ pale; unguis small, equal and simple.

Wings with dense brown scales, almost *Tæniorhynchus*-like in form, first submarginal cell much longer, but scarcely narrower



than the second posterior cell, its base much nearer the base of the wing than that of the second posterior, its stem not quite a fourth of the length of the cell, stem of the second posterior about two-thirds the length of the cell, posterior cross-vein slightly more than its own length distant from the mid.

*Length*, 3 mm.

*Habitat*, Lushai Hills, Assam [E. C. Macleod].

*Observations*.—Described from two females. It comes very near *Stegomyia amesii*, Ludlow, but can at once be told by having a large white spot in the middle of the front of the head. One specimen shows some pallid scales on the mid lobe of the scutellum and the white lateral spots do not form bands at all.

\*9. *Stegomyia albolateralis*, sp. nov.

Thorax blackish brown with a broad silvery white patch on each side in front.

Abdomen black with basal white lateral spots and traces of basal bandings on the apical segments.

Legs and proboscis deep blackish brown, unbanded.

♀. Head clothed with flat dark brown scales, a few grey ones around the eyes and creamy ones at the sides, clypeus black, nude, with a distinct short pointed process on each side, palpi and proboscis deep brown to black, antennæ deep brown.

Thorax black with narrow-curved bronzy scales except at the sides in front where they are silvery white forming two rectangular shoulder-patches, and a few of the same coloured scales pass around the front of the thorax next the head, and there are a few dull creamy ones scattered about before the scutellum and traces of a short pale-scaled line on each side; the scales behind are larger than those in front, chætæ black in front, dull golden over the roots of the wings, scutellum black with flat black scales and golden brown border-bristles, metanotum shiny and black; prothoracic lobes with flat shiny white scales, pleuræ with spots of flat silvery white scales.

Abdomen black with basal lateral silvery white spots which may spread upwards so as to form indistinct basal white bands on the last one or two apical segments, venter with broad basal white bands.

Legs blackish brown, unbanded, coxæ and venter of fore and mid femora pale, the former with silvery white scales, hind femora pale creamy white for about two-thirds of their length, fore and mid ungues equal and uniserrate.

Wings with fork-cells of moderate length, the first submarginal a little longer, but scarcely narrower than the second posterior cell, its base about level with that of the latter, its stem a little more than half the length of the cell, stem of the second posterior cell more than two-thirds the length of the cell, posterior cross-vein sloping towards the apex of the wing, about twice its own

length distant from the mid. Lateral vein-scales long and thin, especially on the third vein.

*Habitat* Sylhet, Assam [*Major Hall*], and Lungleh, Lushai Hills, Assam.

*Time of capture* July at Lungleh, September at Sylhet.

*Observations*.—Described from five ♀ ♀. It is a very marked *Stegomyia*, easily told by the thoracic adornment. One of the specimens shows some additional prominent adornment on the back of the thorax before the scutellum and a dull creamy patch of scales just behind the root of the wings.

The specimen from Lungleh was taken in a bungalow.

\*10. *Stegomyia assamensis*, sp. nov.

Thorax deep brown, a white-scaled area in front less than one-fourth the area of the mesothorax, and a small scaled patch in front of the root of each wing.

Abdomen deep brown, unbanded, with basal lateral white spots, the scales raggedly arranged below. Legs brown, a pale spot near apex of fore and mid tibiæ, a basal pale band to mid metatarsi, hind femora pale, except for a brown band in the middle, base and apex of metatarsi white, base of first hind tarsal white. Proboscis deep brown.

♀. Head black, clothed with flat black scales and some white ones in the middle, a narrow line around the eyes and at the sides, and short thick black chætæ in front projecting forwards and inwards over the eyes, which are large and silvery; palpi black scaled, traces of some paler scales apically; proboscis black; antennæ dark brown, basal segment with grey tomentum.

Thorax shiny black, clothed with bronzy brown narrow-curved scales, except for a small area in front which has pale creamy white scales and a small white-scaled area on each side in front of the roots of the wings passing up on to the mesonotum some short distance, and a small patch of pale scales in front of the bare space before the scutellum; chætæ black to dark brown; scutellum testaceous with flat dusky scales and rich brown border-bristles; pleuræ rich brown with silvery white puncta.

Abdomen deep brown, unbanded, with basal lateral white spots and rather long dusky border-bristles; venter black with basal white bands, the scales long and out-standing, giving a ragged appearance.

Legs brown and banded; fore and mid legs with the femora pale at the base and below, the tibiæ with a creamy area before the apex which is black,—this is most marked in the fore pair; the rest of fore legs unbanded, but in the mid the metatarsus has a pale basal band; femora of the hind legs pale creamy with a broad dark band on the apical half, base and apex of the metatarsus with a pale band, also the base of the first tarsal, remainder dark; fore and mid ungues equal and uniserrate, the hind equal and simple.

Wings with brown scales, the lateral ones dense and rather flattened; fork-cells short, the first a little longer and narrower than the second, its base very slightly nearer the base of the wing than that of the second posterior; its stem not quite as long as the cell, stem of the posterior as long as the cell; supernumerary and mid cross-veins in a straight line, posterior cross-vein about two-and-a-half times its own length distant from the mid.

*Length* 4.5 mm.

*Habitat* Sylhet, Assam [*Major Hall*].

*Time of capture* April (13-iv-05).

*Observations*.—Described from a single ♀. The adornment of the thorax and legs will at once separate it from others of this genus. It presents certain aberrations which, however, are not sufficient to separate it on one-sex characters alone from *Stegomyia*. These characters are the long raggedly arranged ventral scales, the somewhat longer palpi and the somewhat broader wing-scales; these differences are, however, more of size than of structure.

11. *Stegomyia scutellaris*, Walker.

Calcutta, July (3), August (33), September (11), October (5), common during the hot weather and the rains, disappearing in winter, active by day [*N. Annandale*]; Sylhet, Assam [*Major Hall*], April (17); Lushai Hills, Assam [*E. C. Macleod*], May (2), June (11), July (26); Manipur [*C. A. Gourlay*], July (1); Katihar, Purneah District, N. Bengal [*C. A. Paiva*], October.

12. *Stegomyia fasciata*, Fabricius.

Calcutta, May (2), July (3), August (1), September (4), October (4); Lucknow, November (1); Purneah, N. Bengal [*C. A. Paiva*], August (1); Lushai Hills, Assam [*E. C. Macleod*] (? damaged); Bhim Tal, Kumaon, 4,500 ft., September [*N. Annandale*].

13. *Hulecæteomyia pseudotæniata*, Giles.

Lungleh (?), hatched 29-vii-04 (two ♀♀ and three ♂♂). Very large specimens 5 to 5.5 mm.

\*14. *Neomacleaya indica*, Theobald, var. *simplex*, var. nov.

Very similar to the type, but the abdomen has only the median lateral white spots, no trace of banding, and the first submarginal cell is longer than the second posterior cell. The other characters all very similar.

*Habitat* Sylhet, Assam [*Major Hall*].

*Time of capture* June (a single ♀).

\*15. *Leicesteria apicalis*, sp. nov.

Thorax rich brown with a creamy yellow line around the front and sides; pleuræ rich brown with pale spots. Palpi and

proboscis blackish, the former about half the length of the latter.

Abdomen deep blackish brown with apical yellow semicircular dorsal patches and white lateral spots which swell out apically.

Legs brown, with traces of narrow pale basal banding.

♀. Head clothed with brownish flat scales and paler upright forked scales behind and with creamy spindle-shaped scales placed at right angles to the others around the eyes, palpi and proboscis blackish brown, the former very nearly half the length of the proboscis, this with dense scales at the base; antennæ brown, the basal segment large with bright ochraceous scales.

Thorax shiny black with narrow-curved bronzy and dull ochreous scales with a well-defined area of creamy yellow scales around the front and sides; chætæ pale golden brown, especially over the roots of the wings where they are somewhat darker; scutellum testaceous with flat dusky brown and a few dull ochreous scales; metanotum nude, chestnut-brown with a grey sheen in places; pleuræ brown to yellowish brown with numerous patches of small flat ochreous scales.

Abdomen dusky black, each segment with a median apical semicircular yellow patch, and with a lateral snowy white mark which expands apically; hairs and border-bristles golden; venter pale ochreous.

Legs deep brown, banded, femora pale at the base and beneath; traces of pale knee-spots; fore legs with small yellowish bands at the tibio-metatarsal joint, and at the junction of the first tarsal and metatarsal and apex of the first tarsal; in the mid legs the bands are more confined to the base of the segments and occur on the second tarsal also, in the hind legs extending to the other two segments; pale hairs on the tibiæ.

Wings with rather short fork-cells; the first a little longer and narrower than the second, its base a little nearer the apex of the wing, its stem about two-thirds the length of the cell; stem of the second posterior cell nearly as long as the cell; posterior cross-vein about one-and-a-half times its own length from the mid; scales dense on the apical areas of the veins.

*Length* 5 mm.

♂. Palpi long and thin, acuminate, no hair-tufts; longer than proboscis by about the last segment, brown with three pale yellow bands, the last two involving both sides of the segments; antennæ loosely plumose, plume-hairs brown, segments mostly pallid except where the verticillate hairs unite and on the long apical segments; fore and mid unguis unequal, uniserrate.

*Length* 5 mm.

*Habitat* Lushai Hills, Assam [*E. C. Macleod*], 1,500 ft.

*Time of capture* May.

*Observations*.—Described from two ♀♀ and one ♂. Two hatched from larvæ and one caught 1,500 ft.

Closely allied to *Leicesteria longipalpis*, but easily distinguished by the apical abdominal yellow marks.

16. *Desvoidea obturbans*, Walker.

Sylhet [*Major Hall*] and Lushai Hills [*E. C. Macleod*], Assam.  
Four specimens of typical form.

16a. *Desvoidea obturbans*, Walker, var. *fusca*, Theob.

Sylhet, Assam [*Major Hall*], March (2), April (5), May (3), June (2); Lushai Hills, Assam [*E. C. Macleod*], August (11); Calcutta, May (2), August (34), at light, September, October, November and December.

16b. *Desvoidea obturbans*, Walker, variegated-scutellum variety.

Sylhet, Assam, January (2), May (12), June (3); Calcutta, May (1), August (4), September (1), October (1); Lushai Hills, Assam, July (2); Manipur, August (1), in bungalow.

NOTE.—All variations in colour between the true *obturbans* of Walker and the *fusca* of Theobald seen in these specimens, and hence the latter species is sunk as a variety.

\*Genus *BREVIRHYNCHUS*, gen. nov.

Head clothed with flat scales, also the scutellum, the latter large.

Thorax with narrow-curved scales at the edges of the mesonotum; prothoracic lobes and pleuræ with flat scales. Proboscis of ♀ short, thick, about one-third of the length of the whole insect, curved twice; of the male thinner and slightly longer in proportion, palpi of the ♀ two-thirds the length of the proboscis, apparently of two segments, the apical one long; palpi of the ♂ longer than the proboscis, acuminate, no hair-tufts, of four segments, the two last nearly equal.

Wings with dense scales, some *Tæniorhynchus*-like. Fore unguis of male unequal, the larger uniserrate; mid equal and uniserrate.

A very distinct genus easily told by the short, thick sinuous proboscis of the ♀, and the relatively long palpi as well as the squamose structure of the thorax with its flat lateral scales. The mid unguis of the ♂ being equal is also characteristic.

\*17. *Brevirhynchus magnus*, sp. nov.

Thorax rich brown in the middle with white border all around the front and sides, pleuræ densely white scaled; head black, white around the edge and in the middle, the short thick proboscis black; the palpi black, nearly as long as the proboscis.

Abdomen black with basal median yellow patches, snowy white triangular lateral spots. The base of the triangles towards the posterior borders of the segments, but a black line of scales between the fifth, sixth, and seventh spots yellow at the base, venter with broad yellow basal bands, narrow black apical ones.

Legs blackish with faint traces of banding. Male palpi long and thin, acuminate.

♀. Head clothed with rather large flat dusky black scales, creamy white ones at the sides, and some black ones below them and then white again, a narrow band passing around the eyes and some pale ones in the middle; some long golden brown chætæ projecting forwards; proboscis short, thick, swelling apically (but actual apex acuminate), twice curved, jet black, hairy; palpi long and thin, about two-thirds the length of the proboscis, the apical segment very long, black, some pale scales below at the apex and traces of others below at the base of the long segment; antennæ brown, basal segment with some flat pale scales.

Thorax shiny black clothed with long thin narrow-curved bronzy brown scales, becoming broader behind, and with large narrow-curved white scales in front and the sides, forming a white border around the brown central area; toward the roots of the wings the white area is composed of large white flat scales, and some occur elsewhere passing on to the densely flat white-scaled pleuræ, which also bear a median patch of flat black scales; prothoracic lobes covered with flat white scales; chætæ scanty, a patch of golden brown much curved ones, in front of the roots of the wings, rather short; scutellum with flat dusky scales and some paler ones, scales large; metanotum nude, deep brown except at the apex where it is reddish testaceous.

Abdomen blackish, here and there the testaceous integument shines through the scales, first two segments plain, third to eighth with basal yellow scales, the third to fifth with median semi-circular patches, the others with yellow basal bands, very broad on the last two segments, laterally are large snowy white triangular patches, the bases of the triangles towards the apices of the segments, but cut off from them by narrow apical black-scaled lines, the corners of the triangles show on the dorsum as white spots, from the third to the seventh segments as almost apical spots; border-bristles dusky, on the last five segments the white lateral spots are yellow at the base.

Legs thick, black, paler below, white knee-spots and traces of minute pale basal banding, chætæ on the femora and tibiæ golden; fore and mid unguis simple, minutely uniserrate.

Wing-scales dense, brown, a few pale ones near the base broad and almost *Tæniorhynchus*-like in places, first submarginal cell longer and narrower than the second posterior cell, its base nearly level with that of the latter, its stem just a little longer than half the length of the cell, stem of the second posterior cell not quite two-thirds the length of the cell; posterior cross-vein sloping towards the base of the wing, twice its own length distant from the mid; the third long vein carried on as a very distinct pseudo-vein to the base of the wing.

Length 6 mm.

♂. Head, thorax and abdomen much like the ♀, but the flat white scales at the sides of the thorax more numerous and the

scutellum has many pale scales, the lateral lobes having them very dense, black at the base, yellow at the apex. Antennæ plumose, with flaxen brown plume-hairs, palest at their base, proboscis rather short, but not so thick as in the female; palpi thin, acuminate, of four segments, the last two nearly equal, dark brown with a basal pale band to the segments; on hair-tufts, one or two large chætæ.

Legs as in the female, the narrow basal banding rather more distinct, fore unguis very unequal, the larger with a large tooth, the smaller thin and apparently simple, mid unguis equal and uniserrate, hind absent.

*Length* 6 mm.

*Habitat* Sylhet, Assam [*Major Hall*].

*Time of capture* May.

*Observations*.—Described from a ♂ and ♀. A most marked and beautiful species easily told by the quaint proboscis and abdominal markings. The hind unguis of the male absent.

\*Genus *RADIOCULEX*, gen. nov.

Head clothed with small flat scales and a group of upright forked ones behind. Palpi of female thin, longer than in *Culex*, of the male long, longer than the proboscis, composed of two segments, the apical one short and clavate, with thorn-like chætæ; proboscis curved and swollen apically, shorter than the body; antennæ of female pilose, of male densely plumose.

Thorax and scutellum with narrow-curved scales, metanotum nude; blunt curved chætæ project over the head.

Male genitalia with normal narrow claspers. Fork-cells small; the marginal cell of peculiar form in both sexes, swollen out in the middle, contracted near apex of wing and widening again at the apex; scales large, median vein-scales single, small and spatulate.

A very distinct genus with shiny integument, especially on the thorax, and easily told by the curious marginal cell and male palpi.

\*18. *Radioculex clavipalpus*, sp. nov.

Head brown and grey, proboscis deep brown, curved, unbanded.

Thorax deep shiny brown, yellow at the sides, pleuræ pallid.

Abdomen deep violet brown, the segments paler at their bases, but not banded, pale lateral basal spots.

Legs deep brown with narrow pale bands involving both sides of the joints, last hind tarsal pale.

Male antennæ with flaxen plume-hairs, palpi a little longer than proboscis, the apical segment large and swollen but short.

♀. Head clothed with small flat scales all over of a pale ochreous grey, with brown and violet patches seen in certain lights, a large area of black upright forked scales in the middle behind,

with a distinct median division; palpi rather long and thin, clothed with brown scales and some violet ones and a few white ones at the apex; the pale testaceous ground-colour shows through here and there; clypeus shiny, deep brown, traces of a lateral process on each side, antennæ brown, testaceous at the base, hairs dark, proboscis deep brown, curved, not as long as the body.

Thorax black and shiny in the middle, yellow at the sides, the junction of the two colours being abrupt, the median dark area has narrow-curved bronzy scales, the yellow areas have shiny narrow-curved golden scales, in front projecting over the head are tufts of black, blunt, thick, curved bristles of various lengths, over the roots of the wings and in front of them long golden chætæ darkening at their apices; there are also a few pale creamy scales forming a more or less pronounced spot in front of the bare space in front of the scutellum, and an obscure line of the same on each side of it; scutellum blackish with narrow-curved bronzy scales and deep brown border-bristles; metanotum blackish brown, nude; pleuræ pale ochreous.

Abdomen unbanded, clothed with small flat scales showing brown and violet colours, with pale golden border-bristles giving a general false appearance of basal pale bands when examined with a lens; laterally the abdomen shows testaceous hues, and there are pale-scaled lateral marks running right down the segments.

Legs with pallid coxæ, also base and venter of femora; rest dark brown; hind femora yellow at the apex, with five prominent chætæ along one side and smaller ones on the apex, etc.; a narrow pale band at the junction of the metatarsal and first tarsal segments, also first and second tarsals on the fore and mid legs, other segments dark brown; on the hind legs the banding is more pronounced and extends to all the joints, the last segment being almost white below; unguis all equal and simple.

Wings with short fork-cells, about the same length, but the submarginal narrower than the second posterior cell, its base a little nearer the apex of the wing, its stem about one-and-a-third times its length, stem of the second posterior cell a little longer than the cell; marginal cell swollen on the middle, narrowed apically and again expanded at the wing-apex; posterior cross-vein slightly longer than the mid, not quite its own length distant from it; outer costal border spinose; median vein-scales single, small and spatulate; scales dense on subcostal and first long vein; lateral vein-scales on the apical areas of the second, third and fourth veins broad and flat.

*Length* 3.5 to 4 mm.

♂. Head, thorax, abdomen and legs as in the female. Antennæ with dense flaxen plume-hairs, almost golden at their base, flagellum banded; apical segments long, deep brown; proboscis bright ochreous, purple-brown at the apex, which is hairy; palpi longer than the proboscis, straight, of two segments, the apical one short and swollen, ochreous with ochreous scales and some violet ones, especially above and at the apices of the two



segments, the last segment with dark stiff thorn-like chaetae, becoming small towards the apex. Ungues of the fore and mid legs unequal, the fore with a small tooth at the base of the smaller one, a large tooth in the middle of the larger claw and a small spine-like tooth at its base, mid claws with two teeth on the larger claw; none on the smaller; hind claws equal and simple.

Wings with small fork-cells like the female; the submarginal only about half the width of the second posterior-cell, its stem about one-and-a-third times its length; stem of the second posterior also about one-and-a-third times the length of the cell; the first long vein markedly bent in the middle and approaching the upper branch of the second, thus forming a very curious marginal cell; the posterior cross-vein is only half its own length distant from the mid.

*Length* 3.5 to 4 mm.

*Habitat* Calcutta; Berhampur, Murshidabad District, Bengal, 1-1-08 [R. E. Lloyd].

*Time of capture* November and December in Calcutta, and one in July, common in brushwood during the cold weather [N. Annandale]; January at Berhampur.

*Observations*.—Described from a long series, some taken at light. The specimens show some variation in size and colour, but the marked black shiny thorax with the clear-cut yellow area on each side and the quaint marginal cell will at once identify it.

19. *Pseudotheobaldia niveitæniata*, Theobald.

Theog, 8,000 ft., Simla Hills, 2-v-07 [N. Annandale].

20. *Banksiella luteolateralis*, Theobald.

Sylhet, Assam [Major Hall], 23-xi-04 and x-04.

21. *Culex mimeticus*, Noë.

Lushai Hills, Assam [E. C. Macleod], 1-vi-04, one ♀.

22. *Culex microannulatus*, Theobald.

Calcutta, July (7), August (71), September (11), October (4), November (21); Purneah, N. Bengal, August (8); Gopkuda Island, Lake Chilka, Ganjam, August (3); Sylhet, Assam, January (10), February (5), April (1), May (1), November and December; between Bolpore and Rampore Haut, E. I. Railway, Bengal, in railway carriage, August (1).

23. *Culex vishnui*, Theobald.

Sylhet, Assam [Major Hall], January and February; Port Canning, Lower Bengal, July (1); Gopkuda Island, Lake Chilka, Ganjam, August (1).

24. *Culex sitiens*, Wiedemann.

Calcutta, August, September.

25. *Culex gelidus*, Theobald.

Calcutta, August (27), September (7), October (8), November (13), December (4), not uncommon in houses and at light, and in the open on shrubs [*N. Annandale*]; Purneah, N. Bengal, August (3); Katihar, Purneah, N. Bengal, October (1); Sylhet, Assam [*Major Hall*], May (1); between Bolpore and Rampore Haut, E. I. Railway, Bengal, in railway carriage, August [*C. A. Paiva*].

26. *Culex tigripes*, Grandpré.

Calcutta, July (5), August (8), September (2), October (6), November (2); Damukdia Ghat, E. Bengal, July (3); Manipur [*C. A. Gourlay*], in bungalow, August; Sylhet, Assam [*Major Hall*], February 1904 (1), April 1904 (1), May 1904 (1), December 1904 (2); Port Canning, Lower Bengal, December 1907 (2).

27. *Culex fatigans*, Wiedemann.

Calcutta, August (3), October (13), November (2), December (5), common in houses, only bites in the evening and at night [*N. Annandale*]; Lucknow, November (38); Gopkuda Island, Lake Chilka, Ganjam, August (2); Berhampur, Murshidabad District, Bengal [*Major R. Milne*], December (9); Anaithpur, Bijnor District, United Provinces, November; Siliguri, N. Bengal, July (1); Purneah, N. Bengal, August (2); Meenglas Dooars, Jalpaiguri, June [*C. Wallich*]; Sylhet, Assam [*Major Hall*], January (4), February (8), April (9), May (14), June (22), August (1), November (3), December (2); Manipur [*C. A. Gourlay*], grass compound, August (19); Lushai Hills, Assam, June, July and August (3); Bhogaon, Purneah, N. Bengal, October (1).

\*28. *Culex minor*, sp. nov.

Head brown, slightly darker at the sides and paler around the eyes; proboscis and palpi brown.

Thorax bright brown; pleuræ ochreous with two brown patches.

Legs deep brown, unbanded, bases pallid.

Abdomen deep brown, with pale lateral basal spots and pale venter.

♀. Head deep brown, with pale narrow-curved scales, pale lateral flat scales and blackish upright forked scales, except in front between the eyes where they are golden brown, chætæ black, except between the eyes where they are golden; proboscis, palpi, antennæ and clypeus brown.

Thorax dark brown, clothed with very slender narrow-curved bright brown scales, paler just in front of the head and at the sides,

larger chætæ deep brown, but the smaller ones in front of the wings, and some over the head pale golden; scutellum pale brown with small narrow-curved pale golden scales similar in colour to those at the mesonotum near it; pleuræ pale ochreous with some pale flat scales and two dark patches; metanotum bright chestnut-brown.

Abdomen deep brown, clothed with deep brown scales and with dull white lateral basal patches, but extending partly along the whole length of the segments; border-bristles pale, venter mostly grey scaled.

Legs brown, unbanded, coxæ pallid, base and venter of femora pale; unguis small, equal and simple.

Wings with rather long fork-cells, the first submarginal much longer and a little narrower than the second posterior cell, its base nearer the base of the wing, its stem less than one-third the length of the cell; stem of the second posterior about two-thirds the length of the cell; mid cross-vein nearer the apex of the wing than the supernumerary, the posterior cross-vein nearly twice its own length distant from the mid.

*Length* 3 to 3.5 mm.

♂. Palpi thin, brown, the last two segments about equal, with short black bristles, scarcely to be called a hair-tuft. Fore unguis unequal, uniserrate; mid nearly equal, uniserrate; hind small, equal and simple.

Wings with the first submarginal cell a little longer and narrower than the second posterior cell, its base a little nearer the base of the wing. Claspers of male genitalia rather broad, lateral process of basal lobe with three large broad spines and three smaller ones.

*Length* 3 to 3.5 mm.

*Habitat* Sylhet, Assam [*Major Hall*]; Lushai Hills, Assam [*E. C. Macleod*]; Calcutta [*N. Annandale*]; Lungleh, Lushai Hills, Assam.

*Time of capture* Calcutta in December; Lushai Hills, June, July.

*Observations.*—Described from two ♀♀ and three ♂♂. A small obscure species easily told by its unbanded abdomen. It can only be confused with *Culex fuscocephala*, Theob., described from Ceylon, but the latter has a dark fuscous head, and there are no basal lateral pale spots.

#### 29. *Tæniorhynchus ager*, Giles.

Sylhet, Assam [*Major Hall*], January (5), February (2), April (1), May (1); some specimens large, up to 6 mm.

#### 30. *Tæniorhynchus tenax*, Theobald.

Sylhet, Assam [*Major Hall*], March (1), April (1), May (2), June (1); Manipur [*C. A. Gourlay*], August.

\*31. *Chrysoconops pygmæus*, sp. nov.

Head and thorax golden yellow, proboscis and palpi ochreous, with dusky scales especially at the tip of the proboscis.

Abdomen violet-brown with some basal creamy bands and yellow-scaled apex.

Legs unbanded ochreous brown.

Wing-scales brownish, fork-cells rather small.

♀. Head yellowish brown clothed with creamy yellow narrow-curved scales, dense golden yellow upright forked scales and golden chætæ. Eyes black and silvery. Palpi rather long, ochreous with rather transparent dusky scales and black chætæ; proboscis ochreous, clothed with metallic violet-brown scales; antennæ brown with pale bands at the verticels and testaceous basal segments.

Thorax bright reddish brown, shiny, clothed with golden yellow curved scales and golden yellow chætæ; scutellum similarly adorned, with two large golden posterior border-bristles on each side of the mid lobe and two very small ones between; metanotum golden yellow; pleuræ yellow and brown with two patches of silvery white flat scales.

Abdomen clothed with brown and metallic violet scales, the fourth segment with a basal yellow-scaled band, the next with a more prominent one and the apical segments with many yellow scales, hairs golden.

Legs ochreous, clothed with brown scales which darken towards the end, base and venter of femora with ochreous scales, in some lights the leg-scales show violet reflections; chætæ brown; unguis dark, equal and simple.

Wings with brownish scales; fork-cells rather short, the first submarginal a little longer and narrower than the second posterior, its base a little nearer the apex of the wing than that of the latter, its stem nearly two-thirds the length of the cell, stem of the second posterior a little more than half the length of the cell; posterior cross-vein not quite its own length distant from the mid. Halteres pale yellow.

Length 4 mm.

Habitat Sylhet, Assam [*Major Hall*].

Observations.—Described from a single perfect ♀. It comes very near *Chrysoconops brevicellulus*, but can be told by the completely golden thorax, smaller size and different venation.

32. *Chrysoconops brevicellulus*, Theobald.

Calcutta, August (1); Sylhet, Assam; Sangar, Manipur Hut, February (1), May (1), June (1), at night; Manipur [*C. A. Gourlay*], August, on wall of bungalow.

33. *Mansonia uniformis*, Theobald.

Sylhet, Assam [*Major Hall*], January (2), February (3), March (1), May (8), June (3), July (1), December (4); Manipur [*C. A.*

Gourlay], June and September, in a stable and bungalow ; Gopkuda Island, Lake Chilka, Ganjam, August, 7-15 P.M. (2) ; Bhogaon, Purneah District, N. Bengal [C. A. Paiva], October (24) ; Calcutta, November (17), some at light ; Katihar, Purneah District, N. Bengal [C. A. Paiva], October (17).

34. *Mansonioides annulifera*, Theobald.

Calcutta, August and December (2) ; Port Canning, L. Bengal, December [N. Annandale] ; Manipur [C. A. Gourlay] ; Katihar, Purneah District, N. Bengal [C. A. Paiva], October ; Sylhet, Assam [Major Hall], May (4), June (3).

N.B.—This species comes in the genus *Mansonioides*, Theob., not *Mansonia*.

\*35. *Mimomyia minuta*, sp. nov.

Head dull ochreous brown, proboscis long and thin, unbanded. Thorax dark shiny brown, pale ochreous at the sides.

Abdomen deep brown with basal creamy yellow bands and pale basal lateral spots.

Legs brown with narrow pale bands involving both sides of the joints.

♂. Head small, triangular in outline, clothed with small flat dull ochreous scales behind and dull brown darker ones in front, some large black upright forked scales behind ; antennæ long, brown, basal segment shiny reddish brown with a long bristle, second segment long, longer than the next three, pale at its base, hairs moderate, (not plumose) ; proboscis deep brown, long and thin, swollen apically, nearly as long as the whole body ; clypeus small, triangular, dark brown ; palpi very short, thick and conical.

Thorax deep shiny brown, with brown chætæ (denuded), some narrow-curved bronzy brown scales showing ; scutellum black with narrow-curved bronzy brown scales with deep brown border-bristles, four to the mid lobe ; metanotum deep brown, paler in the middle ; pleuræ pale ochreous with an irregular dark central patch.

Abdomen deep brown, the segments with basal creamy bands which are contracted in the middle and which spread out laterally to form basal lateral spots, posterior border-bristles pale golden ; venter banded with dull white, black and ochreous scales, the latter apical, the black colour median.

Legs brown, base and venter of femora yellowish, knee-spots dull white, the joints of the tibiæ and tarsi with narrow yellow bands involving both sides of the joints.

Wings with a single row of small spatulate median vein-scales, and some large narrowly pyriform lateral vein-scales ; costa spinose, fork-cells of nearly equal length, the first submarginal a little narrower than the second posterior, its stem nearly as long as the cell, stem of the second posterior cell about two-thirds the length of the cell, the base of the second fork-cell nearer the base of the

wing than that of the first fork-cell; posterior cross-vein longer than the mid, rather more than its own length distant from it.

*Length* 2·8 mm.

*Habitat* Sylhet, Assam [*Major Hall*].

*Time of capture* November (27-xi-04).

*Observations*.—Described from a single ♂. It may be pointed out that the unguis of the fore legs seem to be simple and are unequal and curved; the mid appear to be equal and simple and the hind ones very small; without dissection the structure of the unguis cannot be made out accurately.

36. *Ædeomyia squamipenna*, Arribalzaga.

Calcutta, at light, November (1).

Family CORETHRIDÆ.

37. *Corethra asiatica*, Giles.

Calcutta (Zoological Gardens, Alipore), May (1), July (1), August (36), common resting on damp walls during the daytime and flying to light at night (Museum compound) [*N. Annandale*], September (16), November (6), December (2); Sibpur, near Calcutta, August (2); Katihar, Purneah District, N. Bengal, at light (1).

## MISCELLANEA.

### MAMMALS.

MEASUREMENTS OF THE SKELETONS OF TWO LARGE INDIAN ELEPHANTS IN THE COLLECTION OF THE INDIAN MUSEUM.—

(1) ♂, *Bilkandi, Nia Dumka, Santal Parganas, presented by Mr. W. M. Smith, 1870.*

(Cf. W. L. Sclater, *Cat. Mamm. Ind. Mus.*, ii, p. 207, specimen a.)

Height from anterior dorsal ver-	Ft.	In.
tebræ, highest point ..	11	3
Height from highest point of		
scapula ..	10	6
Frontal length of skull ..	0	49·6
Orbital breadth of skull ..	0	29·25
Length of humerus ..	0	41·25
„ „ ulna ..	0	39
„ „ femur ..	0	48
„ „ tibia ..	0	30
Circumference of tusk at socket ..	0	21·75

From the manner in which it is mounted, it is possible that the height of the skeleton is exaggerated by a few inches, but the animal in life probably measured 12 feet from the highest point. This appears to be a record so far as *E. indicus* is concerned. The tusks of the specimen are not in the Museum.

(2) ♂, *presented by H. H. the Maharaja of Benares, 1906.*

Height from anterior dorsal ver-	Ft.	In.
tebræ, highest point ..	9	4
Height from highest point of		
scapula ..	9	0
Frontal length of skull ..	0	45
Orbital breadth of skull ..	0	25
Length of humerus ..	0	38
„ „ ulna ..	0	36
„ „ femur ..	0	42
„ „ tibia ..	0	25·5
Circumference of tusk at socket ..	0	13·5

This elephant headed the procession at the Delhi Durbar in 1903, and was thought to be an elephant of unusual height and power.

The tusks had been artificially shortened.

T. BENTHAM.

THE YOUNG OF *Ælurus fulgens*.—The two individuals examined are about three weeks old and were born in captivity, in July, the mother, in a pregnant condition, having been caught by some Bhutias in the vicinity of Darjiling and kept in the Museum there. The young are totally different from the adult in coloration, but the characteristic markings are fairly well defined. The following is a short description :—

Back dull smoky fawn becoming blackish grey on the under parts; the crown of the head and sides of the face, with the exception of the rings round the eyes, greyish red; the legs, tail, and ears smoky brown, the white markings of the adult being here represented by dark grey.

T. BENTHAM.

### BATRACHIA.

NOTES ON SOME BATRACHIA RECENTLY ADDED TO THE COLLECTION OF THE INDIAN MUSEUM.—The specimens noticed below are chiefly from the Amherst District, Tenasserim, and the Himalayas. Those from the former district were taken by myself in March last, those from the Himalayas mostly by Mr. R. Hodgart, the Museum Collector.

#### *Rana vicina*, Stoliczka.

Numerous specimens from British Garhwal at an altitude of about 6,000 feet [*Hodgart*]. This is the common frog of the S. W. Himalayas at about this altitude.

#### *Rana doriae*, Boulenger.

Several small specimens from a jungle stream in the Dawna Hills near Kawkareik (or Kawkareit) in the interior of the Amherst District (altitude about 3,000 feet), March 1908.

#### *Rana laticeps*, Boulenger.

A large specimen from a jungle stream in the same locality, but nearer the base of the hills. Apparently a common species above about 2,000 feet.

#### *Rana limborgi*, W. L. Sclater.

A specimen from the same locality (2,000 feet), agreeing in proportions and other characters with Sclater's description, but differing slightly in colour. I have been unable to trace the type specimen of this species, which should be in our collection.

#### *Rana limnocharis*, Wiegmann.

Equally common in swamps in the plains and in jungle streams in the Himalayas and the mountains of Burma up to 5,000 feet. Some specimens were lately collected on Baratang Island of the



Andaman group by Mr. B. B. Osmaston, who presented them to the Museum. On account of their peculiar coloration they were sent for examination to Mr. Boulenger, who agreed that they belonged to this species. The dorsal surface was of a rich chocolate-brown when the specimens were fresh, and the limbs were profusely banded.

*Rana nigrovittata*, Blyth.

Several specimens from the neighbourhood of Moulmein, near the coast of the Amherst District.

*Ixalus cinerascens*, Stoliczka.

A specimen from the Dawna Hills which agrees well with the type. There are several specimens in our collection taken by Stoliczka, one of them being the type.

*Ixalus annandalei*, Boulenger.

A specimen from Kurseong [*Annandale*], July 1908.

A very abundant species round Kurseong (altitude 4—5,000 feet), where it is known to Europeans as the "coppersmith frog," from its peculiar metallic and monotonous croak, which continues all day in dull weather. It often sits in tea-bushes, one individual answering another in a neighbouring bush.

*Bufo stomaticus*, Lütken.

A specimen from Kurseong [*Hodgart*], and another from Damukdia on the Ganges (E. Bengal). This species is not uncommon at an altitude of 5,000 feet in the Darjiling district. If it is really distinct from *Bufo andersoni*, the ranges of the two overlap.

*Megalophrys parva*, Boulenger.

Numerous tadpoles of a *Megalophrys* were obtained in a jungle stream in the Dawna Hills at an altitude of about 3,000 feet. They agreed with examples of the larva of *M. montana* from the Malay Peninsula, except in colour. Mr. Boulenger, who has examined specimens, believes them to belong to the species he has just redescribed under the above name (*Proc. Zool. Soc. London*, 1908).

N. ANNANDALE.

BREEDING HABITS OF *Tylototriton verrucosus*.—In order to obtain further information regarding the breeding habits of this newt I visited Kurseong in the Darjiling hills at the beginning of last July. In every small pond or large puddle of rain water the females were abundant, but I did not see a single male. Numerous eggs were found lying on the bottom of the pools, sometimes singly and sometimes joined together in pairs as described in my former note (*Rec. Ind. Mus.*, vol. i, p. 278); occasionally they were attached lightly to blades of grass. As early as the first week in

July the eggs contained embryos ready or nearly ready to break loose as free larvæ, which already have external rudiments of fore limbs. The exact stage at which the larvæ emerge seems to differ slightly in different individuals.

As regards Mr. Hodgart's statement that the newts are able to draw blood by means of their tails from the hand of a captor, I can only say that I failed to observe anything of the kind. The tail is to some extent prehensile, and is curled round the finger when the animal is held in the hand. In the living female the ridge at the base of the tail is soft, only becoming hard when the animal is dead and has been preserved in formalin.

N. ANNANDALE.

### FISH.

THE OCCURRENCE OF *Rhinodon typicus* AT THE HEAD OF THE BAY OF BENGAL.—A specimen of this rare basking shark was recently caught by Captain Gorr of the Pilot's Ridge light vessel at the mouth of the River Hooghly, and presented to the Museum by Mr. W. L. Allnut.

The measurements of the freshly caught fish were as follows:—

	Feet.	Inches.
" Length from nose to tip of tail ..	14	0
Round the head ..	8	6
„ „ stomach ..	9	6
Across the nose ..	4	0
„ „ mouth ..	3	6 "

The specimen was harpooned at the surface, over  $26\frac{1}{2}$  fathoms of water (Lat.  $20^{\circ} 51' 30''$  N., Long.  $87^{\circ} 52' 0''$  E.), on March 23rd.

The colour of the skin was dark bluish grey with large, irregular paler blotches. The teeth were very small and numerous, each consisting of a single recurved cusp. They were arranged in a band on the upper and lower jaw, each band extending nearly to the angles of the mouth. Each band contains about 350 rows of teeth, each row consisting of about 10 teeth, making about 7,000 in all.

Although the shark has been recorded from Ceylon and Java, this appears to be the first time it has been met with in the upper parts of the Bay of Bengal.

R. E. LLOYD, Capt., I.M.S.

### SPONGES.

NOTE ON *Ephydatia meyeri* (CARTER).—On page 272, vol. i of these "Records," it is stated that the presence of vesicular cells in the parenchyma is a recognized character distinguishing *Ephydatia fluviatilis* from *E. mülleri*, and the conclusion is drawn that *E. meyeri*, Carter, is a variety of the former species. This is a serious error, as exactly the contrary is the case. The note was printed during my absence from India, and a printer's error or *lapsus calami* crept in whereby "*fluviatilis*" was printed for "*mülleri*." The

whole of the passage was then changed, apparently without reference to the literature cited, which is therefore misquoted, and the error was thus perpetuated. The presence of vesicular cells (*Blasenzellen*) in the parenchyma is recognized as being characteristic of *E. mülleri*, distinguishing it from *E. fluviatilis*. Unless, therefore, the three forms are either to be considered distinct or united as races or phases of a single species, the Indian form, *E. meyeri* must be regarded as a sub-species or variety of *E. mülleri*; Dr. Weltner's view, to which reference is made in my note, must therefore stand. I can only offer my sincerest apologies to Dr. Weltner, and to anyone who may have been misled. It was only recently that I had occasion to refer to my note and realised the mistake.

N. ANNANDALE.



Owing to delay in the press two important papers on Diptera, which were to have been issued in this part, have been omitted. They will be issued immediately as an additional number (vol. ii, part v) of the "Records."



XXXI. REPORT ON A COLLECTION OF  
AQUATIC ANIMALS MADE IN TIBET BY  
CAPTAIN F. H. STEWART, I.M.S., DURING  
THE YEAR 1907.

PART I.—INTRODUCTION, CœLENTERATES, NEMATOMORPHA,  
ROTIFERS AND GASTROTRICHA, ENTOMOSTRACA,  
ARACHNIDS, FISH (*Systematic*) AND  
BATRACHIA.

INTRODUCTION.

By F. H. STEWART, *M.A., D.Sc., M.B., Capt., I.M.S.*

The collection which forms the subject of the following report, was made in the district between the Tang-la and the town of Gyantse in Tibet during the year 1907. The Tang-la is the pass which leads from the Chumbi Valley into Tibet proper, crossing the watershed of the main chain of the Himalayas at a height of 15,000 feet above sea-level. To the north of it the streams run into the Tsang-po, to the south into the Brahmaputra and the Ganges. Gyantse lies about one hundred miles by road north of the Tang-la at an altitude of 13,100 feet. Collections made in this region thus obviously have a double interest, firstly from the geographical position, and secondly from the altitude of their source.

No general collections of the aquatic invertebrate fauna of this part<sup>1</sup> of Tibet have been made previously, but fishes and amphibians were collected during the Tibet Expedition of 1904 in this district, while those from the upper reaches of the Sutlej and Indus may also be counted as Tibetan.

In crossing the Tang-la the character of the country is seen to change entirely. We are leaving the well-watered sphere of the monsoon for a region of dry arid hills which, during the greater part of the year, are entirely bare of vegetation. The rainfall changes from the steady six months' downpour of Sikkim to a scanty fall for one month only about August. Snow also falls in very small quantities except in the immediate neighbourhood of the passes. During the winter of 1906-07 it only lay in the Gyantse valley for one day, and on the hills around for short periods which, if added together, would not total more than one month. Thus during the greater part of the year the lakes and rivers are fed only from springs, which arise here and there on the hillsides.

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<sup>1</sup> Specimens of the Phyllopods *Branchinecta orientalis* and *Estheria davidi* were collected in Gyantse by Capt. Lloyd, I.M.S., and noticed by Gurney in *Journ. Asiat. Soc. Bengal*, ii (N.S.), 1906.

The first considerable mass of water met with is the Rham-Tso (see plate xxvi), a lake situated about twenty miles from the pass at an elevation of 14,700 ft. It is about eight miles long by four broad, and appears to be shallow throughout. It occupies the whole of the north-eastern end of a broad plain which is surrounded on all sides by mountain chains. The southern portion of this boundary is the Chumolhari group of mountains covered with perpetual snow. From April to October this lake is entirely free from ice. In October ice begins to form round the margins and gradually spreads until it covers the whole surface. The winter months are, of course, intensely cold. During the summer, however, no climate could be more delightful. In the daytime the temperature rises to about that of an English summer's day and even at night remains moderate, so ringed in is the plain by bare hills which store up the sun's heat. During these months the Rham-Tso is well peopled. All round its grassy banks, bar-headed geese rear their families, while ducks of many kinds are to be seen on its waters. Fish are exceedingly plentiful, and large numbers are caught in nets set on stakes across the outlet at the northern corner of the lake, where a small river runs out to fall into Kala-Tso four miles to the north. These fish are preserved by the Tibetans by being split like findon haddocks and dried in the sun. They are not salted or smoked. When fresh they are exceedingly good eating, the flesh sweet and free of the muddy taste and the multitude of bones which render Tibetan river fish so unpleasant. The dried fish are, however, not for European taste.

Water weeds grow in abundance for many yards out from the margins of the lake, and Amphipods, Copepods, shells and a species of Hydra flourish among this vegetation.

From Kala-Tso, a lake closely resembling Rham-Tso, but on a somewhat smaller scale, the water escapes under ground in the direction of Gyantse. It reappears about twelve miles off near the village of Mang-tsa (14,500 feet) and, reinforced by several small streams issuing from springs on the hillsides, forms the commencement of the Nyang Chu, the river which flows through the Gyantse valley and ultimately falls into the Tsang-po.

These streams are only completely frozen during the coldest months of the year—February and March. The spring water is sufficiently warm to keep ice-free for some miles during the rest of the year. Here among the moss which grows in the small rivulets, shells and Amphipods, Oligochætes and Turbellarians abound. Small loaches (*Nemachilus stoliczkae*) are also common.

Twenty miles nearer Gyantse, at Kang-ma, is a group of springs, the water of which is tepid and heavily charged with carbon dioxide. The only animals found in these springs are certain Ostracods (*Eucypris minuta*, v. Dad.).

In the Gyantse valley itself the river flows with considerable rapidity. The water is grey and loaded with mud. It does not freeze over even in the depth of winter, but from December until April the surface is dotted with ice carried down from above.



The natives of the valley say that the large fish migrate down into the Tsang-po in the autumn and return in spring. The first fish of any size which I obtained in spring were all *Schizopygopsis stoliczkæ* or *Ptychobarbus conirostris*. The other species appeared later.

In the Gyantse valley, as elsewhere in Tibet, there is an elaborate system of irrigation channels branching off from the rivers. During autumn these abound with young fish, and as in November most of these channels are allowed to run dry, a great loss of young life must result.

Two of the best collecting places in the valley are Te-ring Gompa and High Hill Gompa, two monasteries situated on the hill faces several thousand feet above the valley. A spring arises near each, and Turbellarians, Amphipods, Oligochaetes, Rotifers and frogs abound among the moss, algæ and stones.

Through the courtesy of the Director General of Observatories I am able to give the following table showing the maximum and minimum temperatures recorded each month during 1907 in Gyantse.

GYANTSE, 1907.

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
Maximum temperature in degrees Fahr.	43·3	39·5	46·3	57·2	65·6	73·0	74·8	74·5	73·4	66·4	54·6	43·4	59·3
Minimum temperature.	8·7	8·8	13·8	27·6	32·9	42·7	47·6	44·4	43·1	32·3	12·3	4·0	26·5

OBSERVATIONS ON SPECIMENS OF *HYDRA* FROM  
TIBET, WITH NOTES ON THE DISTRIBUTION OF  
THE GENUS IN ASIA.

By N. ANNANDALE, D.Sc., Superintendent, Indian Museum.

*Hydra fusca*, Linn.

? *H. rhætica*, Asper, Zool. Anz., 1880, p. 205.

Several specimens from among weeds in the Rham-Tso (lake) at an altitude of about 15,000 feet; taken in August, 1907 (Capt. F. H. Stewart).

The specimens, which are much contracted and have suffered in transit, have a pale orange-brown colour in spirit; but Capt. Stewart tells me that they were red in life. Some of them have five and some six tentacles; no gonads are present, but one individual bears a large bud with five well-developed tentacles. The bud arises very near the base of the parent polyp. The larger nematocysts, which are not numerous on the tentacles and very scarce on the body, measure 0.0135 mm. by 0.0108 mm.; their threads appear to be short and rather stout and the cnidocils are short and inconspicuous.

In diagnosing such specimens it is impossible to come to a very definite conclusion. The species they represent resembles Asper's form, which was found in a Swiss Alpine lake, in its red colour and in the number of its tentacles. Whether *H. rhætica* is specifically distinct from *H. fusca*, Linn., may, however, be doubted. In any case it appears to be distinct from the only other red form that has received a name, viz., *H. rubra*, Lewes, which is stated to be a free-living form only found at considerable depths (Roux, *Ann. Biol. Lacustre*, ii, p. 266, 1907).

I take this opportunity to add some remarks on the distribution of *Hydra* in Asia, a certain amount of additional information having become available since I wrote my two papers on the Bengal species (*Mem. Asiat. Soc. Bengal*, i, 239, 1906, and *Journ. Asiat. Soc. Beng.*, 1907, p. 27).

I am indebted to Major J. Stephenson, I.M.S., Professor of Biology, Government College, Lahore, for several specimens taken by him in a small pond in that city. They are well preserved and have, even in spirit, their tentacles considerably longer than their bodies. Several of them bear buds, but no gonads are present. The larger nematocysts, which are far less abundant, especially on the body, than those of *H. orientalis*, measure 0.0135 mm. by 0.0081 mm. and are therefore smaller than those of the Bengal form, which measure 0.0189 mm. by 0.0190 mm.; their threads also appear to be shorter and stouter and their cnidocils to be less conspicuous. The colour in spirit is a dirty white. I think that these specimens are identical with the form called *Hydra fusca* by Linné.

Dr. A. Powell, of the Grant College, Bombay, has found a *Hydra* at Bombay, which differs in its biology from my species, while Capt. H. J. Walton, I.M.S., writes that he has recently taken specimens at Bulandshahr in the United Provinces. These, he says, do not altogether agree with my description of *H. orientalis*, from which it is very probable that both they and the Bombay form are distinct.

During a recent visit to Burma (March, 1908) I found a *Hydra*, apparently identical with specimens from Calcutta, common in a pond at Mandalay; while in a small pool near Moulmein, in Lower Burma, I took a single polyp, which was of an "oil-green" colour and had eight tentacles. None of these specimens showed any sign of sexual activity, but several of the Mandalay examples bore buds. The nematocysts of all agreed with those of *H. orientalis*, to which

I therefore assign even the Moulmein specimen, in spite of its eight tentacles. Such identifications, however, no gonads being present, can only be provisional.

One of my examples from Mandalay exhibited a very remarkable peculiarity, which can hardly have been more than an abnormality. The specimen consists of a parent polyp with four buds. The parent polyp had no trace of tentacles, although possessed of a mouth; but on one of the buds five well-developed tentacles were present, while on the others they had commenced to appear. Other parent polyps from the same pond had normal tentacles.

The following table embodies all that appears to be known as regards the distribution of *Hydra* in Asia:—

TURKESTAN AND SIBERIA	..?	<i>Hydra fusca</i> , Linn., E. v. Daday, <i>Zool. Jahrb.</i> , syst. Abth. xix, p. 480, 1904.
TIBET	..	.. <i>Hydra fusca</i> , Linn. ( <i>vide supra</i> ).
INDIA	..	.. <i>Hydra orientalis</i> , Annand. (Calcutta, North and East Bengal, Chota Nagpur, Upper and Lower Burma). <i>Hydra</i> , spp. (Bombay, United Provinces). <i>Hydra fusca</i> , Linn. (Punjab).
CEYLON	..	..? <i>Hydra orientalis</i> , Annand. (Colombo and Peredeniya), Willey, <i>Spolia Zeylanica</i> , iv, p. 185, 1907.
MALAYA	..	..? <i>Hydra orientalis</i> , Annand. (Penang).
TONQUIN	..	..? <i>Hydra fusca</i> , Linn., Richard, <i>Mém. Soc. zool. France</i> , vii, p. 237, 1894.

Although a considerable number of records of the occurrence of *Hydra* in the East now exist, the absence of gonads makes a definite specific diagnosis at present impossible in most cases; but no form answering to the descriptions of *Hydra viridis* has yet been found in Asia, while the production of eggs has only been observed in the case of *Hydra orientalis*, which seldom produces them at all and sometimes produces them in a degenerate condition<sup>1</sup> possibly due to their not having been fertilized. This form, as I have pointed out elsewhere (*Journ. Asiat. Soc. Bengal*, 1907, p. 28), is very closely related to the Palæarctic species *H. grisea*, Linn. (= *H. oligactis*, Pallas), of which it is possibly a tropical race.

<sup>1</sup> Cf. Weltner, *Archiv f. Naturgesch.*, 73 Jahr. (1), p. 475, 1908.

NOTE ON A FREE-LIVING NEMATODE FROM  
RHAM-TSO LAKE, TIBET.

By DR. J. G. DE MAN, *Ierseke, Zeeland*.

The single specimen of free-living Nematode which was collected by Captain F. H. Stewart in Rham-Tso Lake, Tibet, belongs to a long-tailed species of the genus *Dorylaimus*, Duj., and is apparently most closely related to the well-known *D. stagnalis*, Duj., of the fresh water of Europe. The point of the partly protruded spear is broken off, as also the extremity of the tail.

The measurements of this specimen, which is an egg-bearing female 5.45 mm. long, are the following:—

Length of œsophagus	..	..	1.04 mm.
Distance between posterior extremity of the œsophagus and the genital aperture	..	..	1.33 „
Distance between genital aperture and anus	..	..	2.83 „
Length of the tail	..	..	0.24 „
Length of the body	..	..	5.44 „
Breadth at base of head	..	..	0.023 „
Breadth at posterior extremity of œsophagus	..	..	0.126 „
Breadth at the genital aperture	..	..	0.133 „
Breadth at the anal aperture	..	..	0.063 „
Length of the anterior ( <i>i.e.</i> , antevaginal) part of the genital organs	..	..	0.94 „
Length of the posterior ( <i>i.e.</i> , postvaginal) part of the genital organs	..	..	0.94 „
Proportion between the length of body and the average breadth	..	..	$\frac{4.5}{1}$
Proportion between the length of body and that of œsophagus	..	..	$\frac{5}{1}$
Proportion between the length of body and that of tail	..	..	$\frac{20}{1}$

These measurements fully agree with those of *D. stagnalis*, Duj. (*vide* de Man, "Contribution à la connaissance des Nématodes libres de la Seine et des environs de Paris," *Annales de Biologie lacustre*, ii, 1907, p. 25, pls. ii and iii, fig. 5). Both species fully resemble one another as regards the general shape of the body and of the œsophagus, the structure of the head or cephalic region, the situation of the genital aperture and the shape of the tail. In one character, however, this specimen differs from *D. stagnalis*. On behalf of the quoted paper on the free-living Nematodes of the river Seine, no less than twelve female specimens of *D. stagnalis* were measured by me, for the greater part, if not all, egg-bearing; in all these specimens the posterior part of the genital apparatus proved to be *distinctly longer* than the anterior, *i.e.*, that part which is situated between the genital aperture and the œsophagus; the posterior part, indeed, appeared  $1\frac{1}{3}$  to  $1\frac{1}{2}$  times, in one individual

even twice, as long as the anterior. In the specimen from Rham-Tso Lake, however, the anterior portion of the genital organs appears *exactly as long* as the posterior (*vide* table of measurements). The anterior portion appears but *little shorter* than the œsophagus, while in the observed females of *D. stagnalis* it was usually considerably shorter, for, with a rare exception, the œsophagus proved to be once-and-a-half to twice as long as the anterior part of the genital organs. At either side of the vagina four or five ova are situated, more or less compressed against one another; somewhat farther distant from the genital aperture, each oviduct contains another fully developed egg, 0.1 to 0.11 mm. long.

It is to be regretted that no more specimens were collected, especially male specimens, which probably present greater differences, in which case the Tibetan species would, indeed, be different from *D. stagnalis*.

Prof. von Daday's paper on microscopical freshwater animals from Mongolia (in *Math. Term. Ért.*, Budapest, 24, 1906) is not at my disposal: according to the *Zoological Record*, however, no new species of the genus *Dorylaimus* are described in it.

## SUR LES GORDIENS RECUEILLIS PAR LE CAPITAINE F. H. STEWART DANS LE TIBET.

*Par* LORENZO CAMERANO, *Professeur à l'Université de Turin.*

Monsieur N. Annandale, Superintendant du Musée d'Histoire Naturelle Indien de Calcutta, a eu l'obligeance de me soumettre les Gordiens recueillis par le Capitaine F. H. Stewart dans le Tibet. Comme il s'agit d'une région peu explorée jusqu'à présent je le crois utile de publier les résultats relatifs aux Gordiens qui ont été recueillis, résultats qui viennent compléter aux ceux que j'ai déjà publiés à propos des Gordiens rapportés d'autres régions du Tibet et des pays voisins par l'expédition Russe de 1899 à 1901.

### *Parachordodes pustulosus*, Baird.

Gyantse—(13,120 pieds sur la mer), 11-vi-1907.

♀—Longueur maxima, m. 0.193. Largeur maxima, m. 0.001.

L'animal est d'un brun clair.

Mang-tsa (14,500 pieds sur la mer), Juillet 1907.

♀—Longueur maxima, m. 0.295. Largeur maxima, m. 0.001.

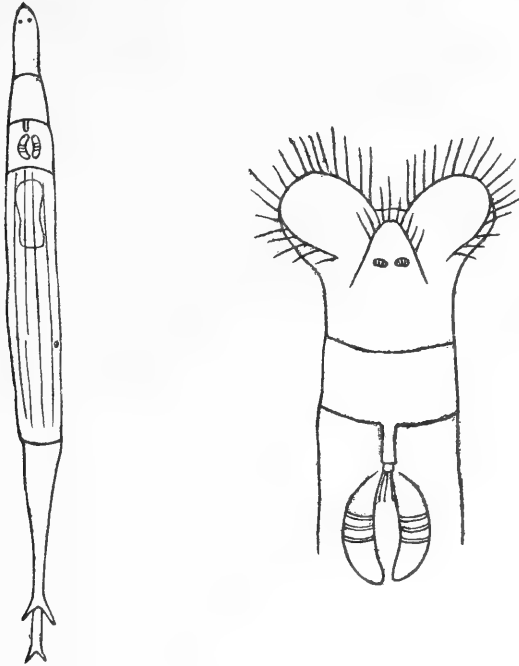
Cet exemplaire est couvert d'un dépôt de carbonate de chaux.

Il s'est trouvé peut-être dans une eau très calcaire après sa mort.



4. *Rotifer tridentatus*, sp. nov. (figs. 1 and 2).

*Specific characters*.—General shape vermiform, slender. Corona divided by a deep and broad sulcus into right and left halves. Eyes circular. The tip of the dorsal column can be partially retracted. There are three circular lines around the neck, from the second of which the antenna arises. The antenna has a minute terminal invertile portion bearing setæ. The body is longitudinally fluted. The foot tapers gradually, with three or four encircling lines.



FIGS. 1 AND 2.

Spurs conical, length .02 mm. There are two long conspicuous pedal glands.

Mastax—Teeth three.

Colourless.

Length .. .. . 5 mm.

*Locality*.—Te-ring Gompa, 14,000 ft., in a small pool among algæ. June.

## PLOÏMA ILLORICATA.

Fam. NOTOMMATADÆ.

5. *Notommata aurita*, Ehrenberg.

*Locality*.—Te-ring Gompa, 14,000 ft. April to September.

6. *Copeus labiatus*, Gosse.

*Locality*.—Chang-lo, 13,100 ft. August.

7. *Proales gibba*, Ehrenberg.

The measurements of this Tibetan form are slightly larger than those given by Gosse, *i.e.*  $\frac{1}{160}$ " in length as compared with  $\frac{1}{360}$ "— $\frac{1}{200}$ ".

*Locality*.—Chang-lo, 13,100 ft., in slowly flowing water among algæ. June.

8. *Diglena catellina*, Ehrenberg.

*Locality*.—Te-ring Gompa, 14,000 ft.

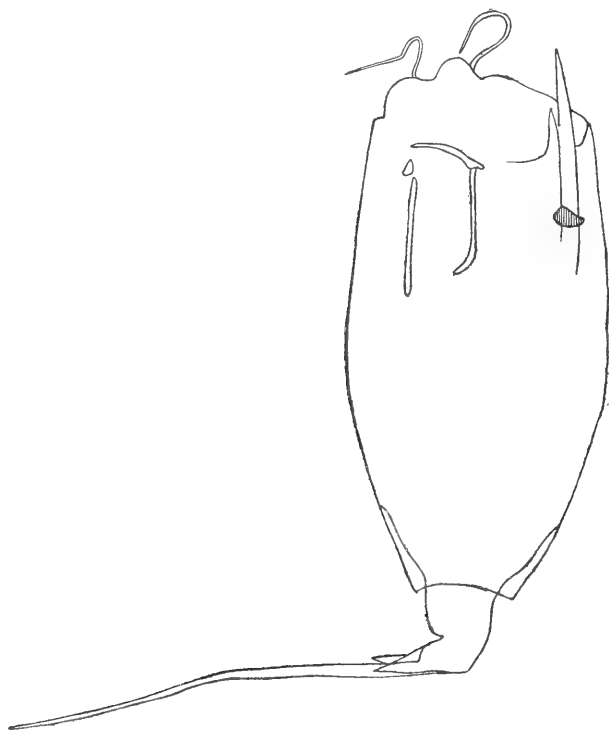


FIG. 3.

PLOÏMA LORICATA.

Fam. RATTULIDÆ.

9. *Mastigocerca auchinleckii*, sp. nov. (fig. 3).

*Specific characters*.—Body fusiform. Head truncate. Occipital margin of lorica armed with two unequal spines of which the longer



is median, the shorter situated to the left. The lorica is ridged in its anterior quarter in continuation of the median spine. Toe  $\frac{2}{3}$  of length of body and head; two minute substyles at the base. Two large flagellæ in the ventral half of the corona. Right malleus absent.

Length—Body and head	..	·27 mm. ( $\frac{1}{90}$ " )
Toe	..	·17 mm. ( $\frac{1}{150}$ " )
Maximum breadth	..	·1 mm.

*Locality*.—Se-chen, 13,000 ft., in small marshy pools. March and April.

This form closely resembles *M. bicornis*, Ehrenberg. It differs from it in the following three points: (1) The short spine is to the left, not to the right of the mid-line. (2) The lorica is ridged. (3) There is a pair of minute substyles.

#### Fam. DINOCHARIDÆ.

##### 10. *Dinocharis pocillum*, Ehrenberg.

*Locality*.—Chang-lo, 13,100 ft. July.

##### 11. *Scaridium longicaudum*, Ehrenberg.

*Locality*.—Gyantse, 13,100 ft.

#### Fam. SALPINADÆ.

##### 12. *Diaschiza exigua*, Gosse.

The form found in Tibet is somewhat larger than that described by Gosse, as the head and body measure  $\frac{1}{290}$ " in length as compared with  $\frac{1}{325}$ " of the English form. It does not, however, correspond with the larger *D. taurocephalus*, Hilgendorff,<sup>1</sup> described from New Zealand, as the head is not so large in comparison with the body as in that form.

*Locality*.—Chang-lo, 13,100 ft. In a small pool off an irrigation channel among algæ. August.

##### 13. *Diaschiza semiaperta*, Gosse.

*Locality*.—Te-ring Gompa, 14,000 ft.

##### 14. *Salpina shapé*, sp. nov. (fig. 4).

This species closely resembles *S. brevispina*, Ehrenberg, differing from it apparently only in the following two points: (1) it is double the length of *S. brevispina*; (2) it is devoid of lumbar spines.

<sup>1</sup> Hilgendorff, *Trans. and Proc. New Zealand Institute*, vol. xxxi, p. 107.

It differs from *S. similis*, Stokes,<sup>1</sup> in (1) the fact that the pectoral spines do not curve toward the dorsum; (2) the absence of lumbar spines.

Length of head and body.. .. '25 mm.  
 ,, of foot and toes .. .. '13 mm.

*Locality*.—Te-ring Gompa, 14,000 ft. May.

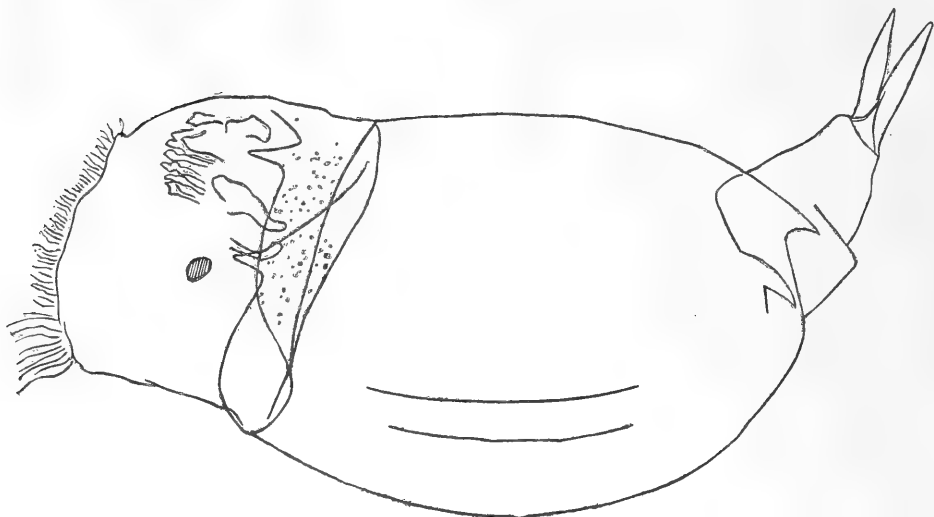


FIG. 4.

#### Family EUCHLANIDÆ.

##### 15. *Euchlanis dilatata*, Ehrenberg.

*Locality*.—Gobshi, 13,100 ft., in a small pool among algæ.

##### 16. *Cathypna amban*, sp. nov. (fig. 5).

*Specific characters*.—Lorica of two unequal plates, both roughly elliptical but truncated at the anterior end. The ventral plate compared with the dorsal is broader at the anterior extremity, and is shorter, as it ends in front of the foot which projects ventrally, whereas the dorsal plate covers the origin of the foot. The occipital edge of the lorica is straight, the pectoral somewhat crescentic. There is no incisura for the foot in either plate. The toes are one-shouldered.

Length .. .. '17 mm. ( $\frac{1}{140}$ " )  
 Maximum breadth .. .. '11 mm.

*Locality*.—Chang-lo, 13,100 ft. July.

<sup>1</sup> Stokes, *Ann. Mag. Nat. Hist.*, 1896, p. 17.

This form resembles *C. luna*, Ehrenberg, but differs from it in the following points: (1) the dorsal plate of the lorica is narrower in front than the ventral; (2) the occipital edge is not inangulated; (3) the horns of the pectoral edge are not so prominent; (4) there is no posterior inangulation of the dorsal plate.

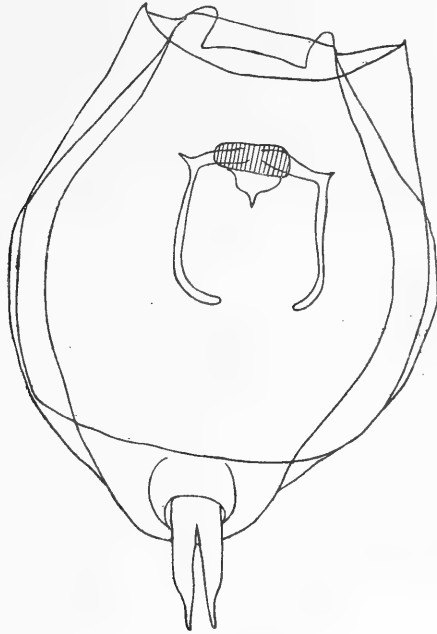


FIG. 5.

## Fam. ANURÆIDÆ.

17. *Notholca scaphula*, sp. nov. (fig. 6).

*Specific characters*.—Shape viewed from the dorsum, broad oval truncated at the head; viewed from the side it is horn-shaped. Lorica of two dissimilar plates, the dorsal broader than the ventral, projecting in two thin wing-like lateral expansions beyond the latter. Occipital margin with six spines, the two central sharpest and highest, sublateral lowest. Pectoral margin with a deep rounded midventral incisura bounded by two flat spines. Dorsal plate 20—24 striæ; ventral plate 10 striæ.

*Corona*.—The outer ring of cilia passes ventrally into the incisura of the pectoral edge, while dorsally it reaches well in front of the tips of the spines. Inside the ring are three dorsal projections bearing large cilia.

*Trophi*.—Teeth, three.

Eye single, immediately anterior to the mastax.

Length .. .. .14 mm. ( $\frac{1}{170}$ " )

Maximum breadth .. .. .07 ,,

*Locality.*—Te-ring Gompa, 14,000 ft. April to September.

This form closely resembles *N. scapha*, Gosse. It differs from it in (1) the more marked difference in size between the central and sublateral spines of the occipital edge; (2) in the greater depth of the incisura of the pectoral edge; (3) there are 20—24 dorsal striæ instead of 11.

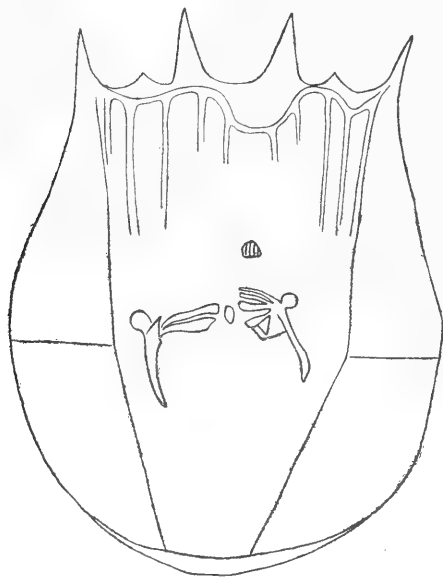


FIG. 6.

## GASTROTRICHA.

### 18. *Lepidoderma squammatum*, F. Dujardin.

Only one specimen was preserved. It corresponds, however, so closely with the description of *P. squammatum* by Zelenka, that there appears to be no doubt about the diagnosis. The transverse rings separating the ciliary fields in the anterior portion of the body and the scales in the same position in the posterior portion can be made out, although the specimen is mounted on its side.

#### *Measurements.*

Length .. .. .	..	..	..	..	.17 mm.
Maximum dorso-ventral measurement of head	..	..	..	..	.026 ,,
Minimum .. .. .	..	..	..	..	.026 ,,
Length of œsophagus ..	..	..	..	..	.05 ,,
,, ,, terminal spur	..	..	..	..	.016 ,,

The latter measurement is the only one which differs appreciably from the corresponding measurement given by Zelenka, *viz.*,

·022 mm. As my specimen, however, is mounted on its side, there is doubtless some foreshortening due to the lateral curve of the spur.

*Habitat.*—Te-ring Gompa, 14,000 feet. 17th May, 1907.

These animals were by no means of frequent occurrence. I believe that I did not find more than three or four specimens in six months' work.

*Lepidoderma squammatum* has been recorded from Germany, France, England, Austria and North America (Zelenka).

*Technique.*—For the two groups of Rotifers and Gastrotricha the only form of technique employed was that of Rousselet—cocaine, osmic acid and formalin (*Journ. Queckett Micr. Club*, vol. v, p. 1), asphalt being used as a cement. This method gave excellent results for observation within three or four months, and about thirty per cent. of the specimens were found to be in very fair condition after fifteen months, in some cases in such a good state of preservation as to repay examination with a  $\frac{1}{2}$ -inch oil immersion lens. When it is considered that the slides had made a road journey of two hundred miles, and had endured extremes of climate from the cold of the Tibetan passes in mid-winter to the full heat of the hot weather in Calcutta, the method may be regarded as having been tested under somewhat adverse conditions, and to have come well out of the test.

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## ENTOMOSTRACA ET HYDRACHNIDAE E TIBET.

[Cum Figuris 9 in Textu.]

PROF. E. DADAY DE DEES.

Illustr. Dom. F. H. Stewart anno 1907 in Tibet ex aliquot localitatibus inter alia etiam materiam planctonicam collegii quam Illustr. Dom. N. Annandale, Superintendens Musei Indian Historiae Naturalis studiendi causa Entomostracorum Hydrachnidarumque ad me misit. Commissionem hanc honorabilem, literatura datis de Entomostracis Hydrachnidisque in Tibet occurrentibus hucusque exceptis ab Illustr. D. G. O. Sars publicatis carente, libenter accepi resultatemque studii mei in subsequentibus breviter conscribere necessarium esse putavi. Notandum est, collectionem Dom. F. H. Stewarti in 17 vitris et e 4 localitatibus species 21 infra partim enumeratas, partim descriptas continere.

Localitates materiae planctonicae examinatae sunt sequentes:—

1. *Mang-tsa*, altitudine 4419·5 mtr. a superficie maris; anno 1907, 2 Julii—2 vitra.

2. *Gyantse*, altitudine 3998·9 mtr. a superficie maris; anno 1907, 4 Augusti, 9 Septembris et 6 Novembris—8 vitra.
3. *Rham-Tso*, altitudine 4480·5 mtr., a superficie maris; anno 1907, 12 Augusti—3 vitra.
4. *Kang-ma*, altitudine 4267·1 mtr., a superficie maris; anno 1907, 18 Augusti—I vitrum.

I.—SPECIES EXAMINATAE SECUNDUM LOCALITATES CONSCRIPTAE.

1. *Mang-tsa*.

*Simocephalus elizabethae* (King).

*Herpetocypris stewarti*, n. sp.

2. *Gyantse*.

<i>Cyclops strenuus</i> (Fisch).	<i>Alona guttata</i> , G. O. Sars.
<i>Cyclops viridis</i> (Jur).	<i>Simocephalus elizabethae</i>
<i>Cyclops serrulatus</i> (Fisch).	(King).
<i>Diaptomus tibetanus</i> , n. sp.	10. <i>Scapholeberis mucronata</i>
5. <i>Diaptomus paulseni</i> , G. O. Sars.	(O. F. M).
<i>Chydorus sphaericus</i> (O. F. M).	<i>Daphnia longispina</i> , Leyd.
<i>Dunhevedia crassa</i> , King.	<i>Potamocypris stewarti</i> , n. sp.
	13. <i>Eulais tibetana</i> , n. sp.

3. *Rham-Tso*.

<i>Cyclops viridis</i> (Jur).	<i>Moina rectirostris</i> (Jur).
<i>Cyclops serrulatus</i> , Fisch.	<i>Ceriodaphnia pulchella</i> , G. O. Sars.
<i>Diaptomus paulseni</i> , G. O. Sars.	<i>Simocephalus elizabethae</i>
<i>Chydorus sphaericus</i> (O. F. M).	(King).
5. <i>Euryalona annandalei</i> , n. sp.	10. <i>Herpetocypris smaragdea</i> ,
<i>Macrothrix hirsuticornis</i> (Br. Nr.).	n. sp.

*Eucypris tibetana*, n. sp.

4. *Kang-ma*.

*Eucypris minuta*, n. sp.

II.—CONSPECTUS SYSTEMATICUS SPECIERUM EXAMINATARUM  
DESCRIPTIONESQUE SPECIERUM NOVARUM.

Ordo COPEPODA.

(1) *Cyclops viridis* (Jur).

*Cyclops viridis*, O. Schmeil (9), p. 97, tab. 8, fig. 12-14.

Specimina numerosa e localitatibus *Gyantse* et *Rham-Tso* collecta examinavi.

(2) *Cyclops strenuus*, Fisch.

*Cyclops strenuus*, O. Schmeil (9), p. 39, tab. 2, fig. 12-15.

*Cyclops strenuus*, W. Lilljeborg (2), p. 28, tab. 2, fig. 20-25.

Specimina numerosa e localitate *Gyantse* collecta examinavi haecque structura pedis quinti paris formae *Cyclopis strenui* formae *lacustri*, Lillj., similia sunt.

(3) *Cyclops serrulatus*, Fisch.

*Cyclops serrulatus*, O. Schmeil (9), p. 141, tab. 5, fig. 6-14.

Species haec cosmopolita in Tibet frequens esse videtur. Specimina numerosa e localitatibus *Gyantse* et *Rham-Tso* collecta examinavi in societate *Cyclopis viridis* et *strenui*.

(4) *Diaptomus tibetanus*, n. sp.

(Fig. 1, a-e.)

Corpus antice parum angustatum, segmento primo longitudinem segmentorum trium segmentorum simul junctorum superante. Segmentum ultimum thoracicum feminae distinctum angulis lateralibus posticis productis, lamelliformibus, magnitudine parum diversis (fig. 1, a). Angulus laminiforme productus sinister dextro parum longior latiorque, aculeo sat magno externo armatus. Angulus dexter brevior angustiorque aculeo externo parvo. Segmentum ultimum thoracicum maris angulis lateralibus posticis parum productis, apice acute rotundatis.

Abdomen feminae triarticulatum, articulo genitali duobus ultimis simul junctis longiore. Abdomen maris 5-segmentatum, segmentis 4 ultimis fere aequilongis.

Laminae furcales longitudine segmentum ultimum abdominale superantes, margine interno setosae.

Antennae primiparis feminae 25-articulatae, retrorsum vergentes apicem laminarum furcalium attingentes vel parum superantes.

Antenna geniculans maris articulo 13 aculeo valido, longo, falciformi armato. Articulus ultimus antennae geniculantis in apice hamulo parvo, introsum vergenti (fig. 1, e).

Pedes quintiparis feminae articulo ultimo exopoditi biaculeato, aculeis sat crassis, endopodito uniarticulato, digitiformi, longitudinem dimidiam articuli primi exopoditi parum superante, apice distali biaculeato, aculeo externo longiore, interno vero brevior (fig. 1, b).

Protopoditum pedis dextri quintiparis maris articulo primo in angulo externo-distali processu lobiformi, articulo secundo cum endopodito connato, marginibus laevibus. Articulus primus exopoditi angulo externo-distali mucronato, mucrone valido, in margine interiori parum tuberculatus. Articulus secundus exopoditi

fere cuneiformis, apicem versus valde angustatus, aculeo valido, curvato, ab apice distali valde remoto, in parte tertia basali sito. Unguis apicalis exopoditi falciformiter valde arcuatus, longitudine articulos tres antecedentes parum superans (fig. 1, *d*). Endopoditum uniarticulatum, perbreve, longitudinem dimidiam articuli primi exopoditi non superans, cuneiformi, extrorsum vergens.

Articulus secundus protopoditi pedis sinistri quinti paris margine interiore laevi. Articulus secundus exopoditi in margine

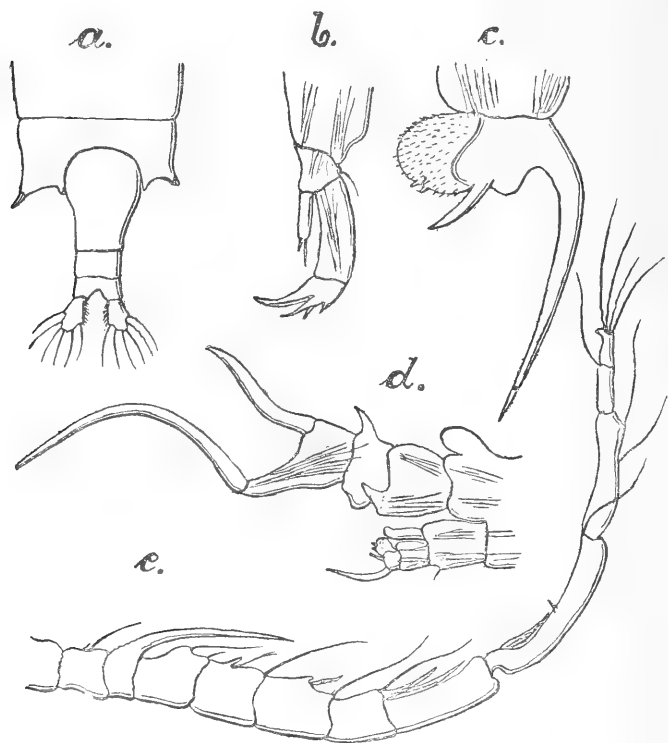


FIG. 1.—*Diaptomus tibetanus*, n. sp.

- (a) Segmenta duo posteriora trunci cum abdomine feminae.
- (b) Pes quinti paris feminae.
- (c) Apex pedis quinti paris sinistri maris.
- (d) Pedes quinti paris maris.
- (e) Pars media antennae geniculantis maris.

interno lobiformiter prominens, lobo rotundato, dense piloso aculeisque parvis 3-4 armato, in margine apicali aculeo brevior, in angulo externo apicali aculeo valido parum falciformi praeditus (fig. 1, *c*, *d*). Endopoditum huius pedis uniarticulatum, digitiforme, longitudine articulum primum exopoditi plusminusve superans.

Longitudo totalis feminae 2 mm.; maris 1·8 mm.

Specimina numerosa e localitate *Gyantse* collecta examinavi.



Species haec nova differt a speciebus ceteris: structura pedum quintiparis feminae precipueque maris.

(5) *Diaptomus paulseni*, G. O. Sars.

(Fig. 2, a, b.)

*Diaptomus paulseni*, G. O. Sars (7), p. 20, tab. 15, fig. 1, a-f.

Species haec adhuc solum e Pamir cognita etiam in Tibet sat frequens esse videtur. Specimina numerosa examinata e localitatibus *Gyantse* et *Rham-Tso* collecta solum structura antennae

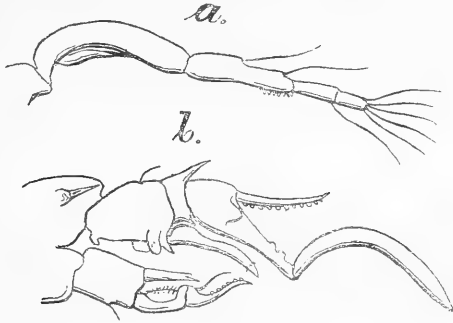


FIG. 2.—*Diaptomus paulseni*, G. O. Sars.

- (a) Pars apicalis antennae geniculantis maris.  
(b) Pedes quinti paris maris.

geniculantis pedumque quinti paris maris differunt a speciminibus adhuc descriptis. Articulus antepenultimus antennae geniculantis scilicet in parte ultima marginis interioris denticulis minutis, serratim ordinatis armatus (fig. 2, a). Articulus secundus exopoditi pedis quintiparis dextri maris prope basin aculei lateralis lamina lobiformi et in margine exteriori prope basin unguis apicalis tuberculis duobus parvis armatus. Endopoditum pedis sinistri quintiparis apicem versus attenuatum, apice bifisso, aculeo minore interno, externo vero majore (fig. 2, b).

Subordo CLADOCERA.

(6) *Chydorus sphaericus* (O. F. M.).

*Chydorus sphaericus*, W. Lilljeborg (1), p. 561, tab. 77, fig. 8-25.

Species haec cosmopolita in Tibet sat frequens esse videtur et ego exemplaria numerosa in materiam e localitatibus *Gyantse* *Rham-Tso*que inveni.

(7) *Dunhevedia crassa*, King.

*Dunhevedia crassa*, G. O. Sars (3), p. 42, tab. 5, fig. 1-4.

Specimina solum duo feminina examinaui e localitate *Gyantse*.

Species haec fere cosmopolita etiam e Ceylon et e Siberia (Akmolinsk) cognita.

(8) *Alona guttata*, G. O. Sars.

*Lynceus guttatus*, W. Lilljeborg (1), p. 468, tab. 68, fig. 16-26.

Species haec etiam e Turkestan enumerata in Tibet sat rara esse videtur, specimina non numerosa solum e localitate *Gyantse* examinavi.

(9) *Euryalona annandalei*, n. sp.

(Fig. 3, a-c.)

Testa corporis subrotundata, margine dorsali late arcuato, marginem versus posteriorem flexuoso et cum margine posteriore angulum acutum, parum prominentem formante. Margo posterior testae in parte superiore parum sinuatus, in parte inferiore rotundatus et in marginem ventralem sine limite visibili ineuns. Margo ventralis testae ante medium parum prominens, in parte posteriore subrectus et in marginem anteriorem sine limite ineuns,

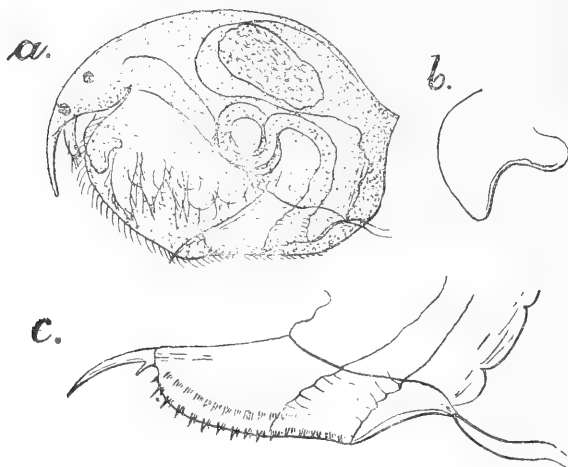


FIG. 3.—*Euryalona annandalei*, n. sp.

(a) Femina a latere visa.

(b) Processus labri.

(c) Cauda a latere visa.

setis parvis armatus (fig. 3, a). Superficies testae concinne granulata.

Caput rostro sat longo, parum arcuato tenuique, sub lineam medianam testae declinato.

Oculus sat magnus; macula ocularis magnitudine oculi, oculo multo quam apice rostri proprior.

Antennae primi paris sat breves, longitudinem dimidiam rostri non superantes.

Processus labri sat parvus, antice late, infra acute rotundatus (fig. 3, b).

Cauda apicem distalem versus parum angustata, margine posteriore vel superiore ultra fissuram analem usque ad partem

tertiam apicalem subrecto, in parte tertia arcuato, serie aculeorum marginalium circa 12-14 serieque laterali aculeorum minimorum fasciculatim dispositorum. Aculei marginales in poribus ordinati, unus major, alter minor tenuiorque, unguis apicalis caudae laevis aculeo basali parvo (fig. 3, c).

Longitudo totalis 0.9—1 mm.; altitudo maxima 0.6—0.65 mm.

Species haec nova in honorem Illustr. D. N. Annandale, denominata forma, longitudine structuraque rostri, testae precipueque caudae differt a speciebus ceteris generis. Specimina solum tres feminina examinavi e localitate *Rham-Tso*.

(10) *Macrothrix hirsuticornis*, Brady-Norm.

*Macrothrix hirsuticornis*, W. Lilljeborg (1), p. 346, tab. 55, fig. 6-14.

Speciei huius etiam e Mongolia enumeratae, solum specimina tres examinavi e localitate *Rham-Tso*.

(11) *Moina rectirostris* (Jur).

*Moina rectirostris*, W. Lilljeborg (1), p. 216, tab. 29, fig. 23-30, tab. 30, fig. 1-12.

Specimina 7 ♀ et 1 ♂ vidi e localitate *Rham-Tso*. Species haec in Europa et in America boreali frequens occurrit etiam in Siberia (Akmolinsk) et in Mongolia.

(12) *Ceriodaphnia pulchella*, G. O. Sars.

*Ceriodaphnia pulchella*, W. Lilljeborg (1), p. 198, tab. 28, fig. 6-18.

Speciei huius in Asia sat frequentis et e Siberia Turkestanque jam cognitae solum exemplaria tria examinavi e localitate *Rham-Tso*.

(13) *Scapholeberis mucronata* (O. F. M.).

*Scapholeberis mucronata*, W. Lilljeborg (1), p. 151, tab. 22, fig. 15-19, tab. 23, fig. 1-7.

Species haec distributione geographica sat constricta etiam in Asia sat frequens esse videtur, enumerata est scilicet e Ceylon et e Siberia. Specimina non numerosa, a me examinata sunt e localitate *Gyantse* collecta.

(14) *Simocephalus elizabethae*, King.

*Simocephalus elizabethae*, G. O. Sars (3), p. 22, tab. 2, fig. 6-7.

*Simocephalus gibbosus*, G. O. Sars (4), p. 15, tab. 2, fig. 4-6.

*Simocephalus vetuloides*, G. O. Sars (5), p. 5, tab. 6, fig. 11-12.

*Simocephalus mixtus*, G. O. Sars (5), p. 18, tab. 6, fig. 4.

Species haec in Asia frequens esse videtur. Secundum opinionem meam species supra enumeratae synonymae sunt et

non dubito quin ipsam species *Simocephalus elizabethae* propter affinitatem magnam *Simocephali vetuli*, varietas sit.

Specimina numerosa vidi e localitatibus *Mang-tsa*, *Gyantse* et *Rham-Tso* itaque species haec in Tibet frequentissima esse videtur.

(15) *Daphnia longispina* (O. F. M.).

*Daphnia longispina*, W. Lilljeborg (1), p. 94, tab. 12, fig. 14, tab. 13, fig. 1-8, tab. 14, fig. 1-9.

Speciem hanc iam a D. G. O. Sars, e Tibet cum varietate *caudata* enumeratam solum e localitate *Gyantse* examinavi hincque specimen unicum vidi.

Ordo OSTRACODA.

(16) *Eucypris tibetana*, n. sp.

(Fig. 4, a-f.)

Conchae ambae forma structuraque similes, a latere visae fere oviformes, altitudine maxima dimidiam longitudinem parum superante.

Margo anterior concharum altitudine posterioris remota, regulariter et acutiusculo rotundatus, lamina hyalina canalibusque pororum carens, tuberculis minimis, setigeris; in marginem dorsalem ventralemque sine limite visibili ineuns (fig. 4, a).

Margo dorsalis concharum late rotundatus, in parte anteriore parum humiliter flexuosus, in parte posteriore late arcuatus et in marginem posteriorem arcuato-flexuoso sineque limite visibili ineuns.

Margo posterior concharum altitudine anteriorem superans, sat late regulariterque rotundatus, lamina hyalina canalibus pororum tuberculisque minimis carens, in marginem ventralem sine limite visibili ineuns (fig. 4, a).

Margo ventralis concharum rectus, non sinuatus, structura marginibus ceteris simili.

Conchae de conspectu dorsali aut ventrali oviformes, antice acute, postice sat late rotundatae, latitudine maxima post medium sita (fig. 4, b).

Testa concharum concinne granulata superficie sat dense setosa. Color ignotus.

Longitudo maxima 1.5—1.8 mm.; altitudo maxima 0.8—1 mm.; latitudo maxima 0.7—1.9 mm.

Antennae secundi paris endopoditi triarticulato fasciculoque setarum natatorium usque ad apicem unguiculorum apicalium vergente. Articulus penultimus unguiculis tribus, denticulatis uno brevioribus duobus multo longioribus armatus. Articulus ultimus in apice unguiculis duobus diversis, uno brevioribus laevique, altero longiore et denticulato (fig. 4, c).

Palpus maxillaris articulo apicali longiore, quam latiore.

Processus manducatorius primus maxillarum in apice aculeis duobus validis, denticulatis (fig. 4, *d*).

Pedes maxillares forma structuraque specierum ceterarum similes.

Pedes primi paris articulis duobus antepenultimis in superficie setosis, articulo penultimo in angulo anteriore distali setis duabus

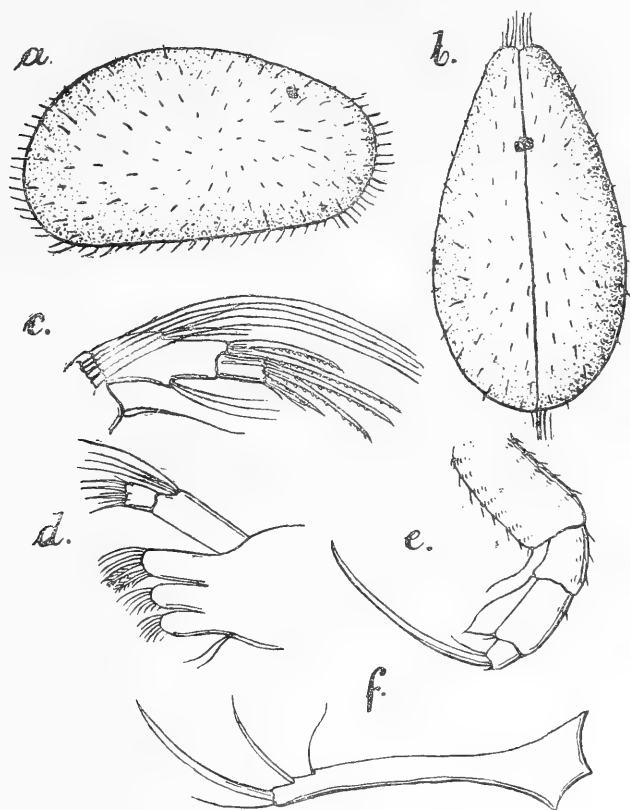


FIG. 4.—*Eucypris tibetana*, n. sp.

- (a) Concha dextra a latere visa.
- (b) Conchae supra visae.
- (c) Endopoditum antennae secundi paris.
- (d) Maxilla.
- (e) Pes primus.
- (f) Lamina furcalis.

inaequalibus. Unguiculus apicalis longitudinem articulorum 3 ultimorum pedis superans, parum falciformiter arcuatus (fig. 4, *e*).

Laminae furcales fere rectae, minime curvatae, margine posteriore vel superiore laevi, seta laterali ad unguiculum lateralem approximata; unguiculo laterali dimidiam longitudinem unguiculi apicalis superante; unguiculo apicali fere longitudine dimidia laminae furcalis; seta apicali longitudine dimidia unguiculi apicalis.

Specimina numerosa ♀ examinavi e localitate *Rham-Tso*.

Species haec nova speciei *Cyprinotus congener*, Vavr., affinis, sed differt inter alia structura marginis anterioris posteriorisque concharum.

(17) *Eucypris minuta*, n. sp.

(Fig. 5, a-c.)

Conchae ambae inter se similes, a latere visae parum reniformes, altitudine maxima longitudinem dimidiam non attingente (fig. 5, a).

Margo anterior concharum fere altitudine marginis posterioris, late rotundatus, in parte inferiore acutiusculo arcuatus, in parte superiore vero flexuoso arcuatus, in marginem dorsalem ventralemque sine limite visibili ineuns, lamina hyalina canalibusque pororum carens (fig. 5, a).

Margo dorsalis concharum late arcuatus, in parte anteriore

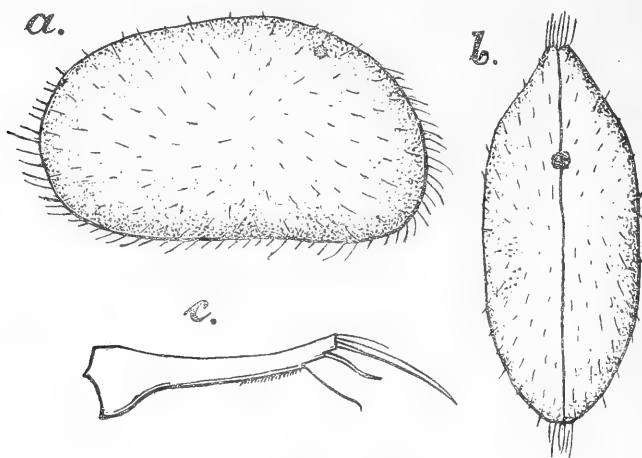


FIG. 5.—*Eucypris minuta*, n. sp.

(a) Concha dextra a latere visâ.

(b) Conchae supra visae.

(c) Lamina furcalis.

tamen altior, marginem versus posteriorem leniter flexuosus et in marginem posteriorem sine limite visibili ineuns.

Margo posterior latiusculo aequaliterque rotundatus, lamina hyalina canalibusque pororum carens, in marginem ventralem sine limite visibili ineuns.

Margo ventralis subrectus, fere in medio minime sinuatus, structura marginis posterioris aequali.

Margo anterior conchae sinistrae lamina hyalina valde angusta.

Conchae supra aut infra visae fere formam navicellae imitantes, apice anteriore acutiusculo, apice posteriore acute rotundato, latitudine maxima in medio (fig. 5, b).

Valvulae concharum superficie concinne granulata sparsimque setosa. Color brunneus. Longitudo 1.2—1.5 mm.

Antennae secundi paris endopodito triarticulato, fasciculo setarum natatoriarum apicem unguiculorum apicalium superante. Articulus penultimus in angulo superiore distali unguiculis duobus aequilongis, denticulatis setisque duabus longis armatus. Articulus ultimus in apice unguiculis duobus validis, denticulatis setaque parva.

Articulus penultimus palpi mandibularis processu aculeiformi, dense setoso, sensorio.

Palpus maxillaris articulo apicali longiore, quam lato.

Processus manducatorius primus maxillae in apice aculeis duobus denticulatis.

Pedes maxillares, pedes primi secundique paris structura specierum ceterarum generis similes. Articulus penultimus pedum primi paris in angulo anteriore distali setis duabus inaequalibus.

Laminae furcales apicem distalem versus parum attenuatae, leviter arcuatae, margine posteriore vel superiore concinne setoso; seta laterali unguiculo laterali approximata, longitudinem unguiculi laterali parum superante; unguiculo laterali longitudinem dimidiam unguiculi apicalis non attingente; unguiculo apicali longitudinem dimidiam laminae furcalis parum superante, leviter arcuato; seta apicali brevi, fere longitudine tertia unguiculi apicali (fig. 5, c).

Specimina non numerosa (4 ♀ et 2 juv.) examinavi e localitate *Kang-ma*.

Species haec nova a speciebus ceteris generis differt forma structuraque concharum.

(18) *Herpetocypris stewarti*, n. sp.

(Fig. 6, a-k.)

(*Femina*, fig. 6, a-b.)

Conchae a latere visae reniformes, inter se parum dissimiles, altitudine maxima longitudinem dimidiam non attingente (fig. 6, a-b).

Concha dextra (fig. 6, a) a latere visa margine anteriore altitudinem posterioris superante sat acute regulariterque arcuato lamina hyalina carente, canalibus pororum distinctibus, rectis, non ramosis; in marginem dorsalem ventralemque sine limite visibili ineunte.

Margo dorsalis conchae dextrae marginem anteriorem versus flexuosus, supra oculum parum tuberculatus, in parte media late arcuatus, marginem posteriorem versus arcuate flexuosoque declinatus et in marginem posteriorem sine limite visibili ineuns (fig. 6, a).

Margo posterior margine anteriore humilior, acute arcuatus, in marginem ventralem sine limite visibili ineuns, lamina hyalina carens, canalibus pororum distinctis, rectis, non ramosis.

Margo ventralis conchae dextrae in medio parum sinuatus, ante sinum late arcuatus, post sinum subrectus, structura marginis anterioris posteriorisque simili (fig. 6, a).

Concha sinistra margine anteriore posterioreque fere aequalto (fig. 6, b).

Margo anterior conchae sinistrae acutiusculo arcuatus, in mar-

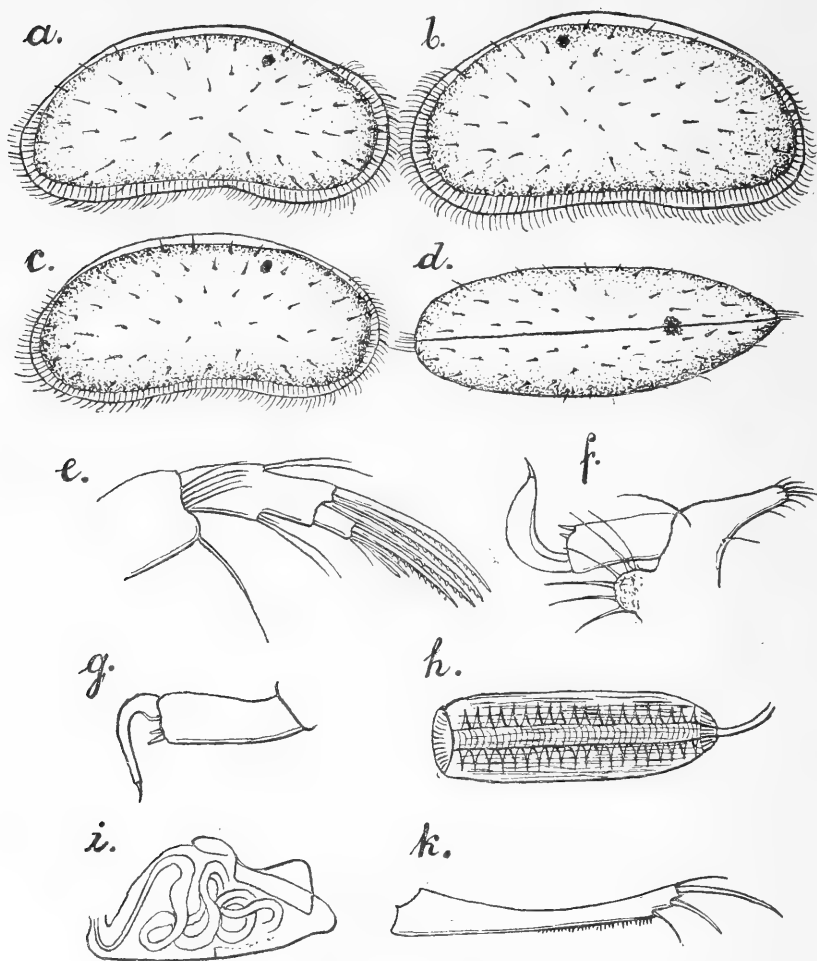


FIG. 6.—*Herpetocypris stewarti*, n. sp.

- (a) Concha dextra feminae a latere visa.
- (b) Concha sinistra feminae a latere visa.
- (c) Concha dextra maris a latere visa.
- (d) Conchae maris supra visae.
- (e) Endopoditum antennae secundi paris.
- (f) Pes maxillaris dexter maris.
- (g) Palpus pedis maxillaris sinistri maris.
- (h) Ductus ejaculatorius.
- (i) Penis.
- (k) Lamina furcalis maris.

ginem dorsalum ventralemque sine limite visibili ineuns, lamina hyalina carens, canalibus pororum rectis, non ramosis.

Margo dorsalis late arcuatus supra oculum minime protuberans,



antice posticeque arcuate flexuosus et in marginem posteriorem sine limite visibili ineuns (fig. 6, *b*).

Margo posterior conchae sinistrae obtuse rotundatus, cum margine ventrali angulum arcuatum formans, lamina hyalina carens, canalibus pororum rectis, non ramosis.

Margo ventralis in medio late sinuatus, ante sinum subarcuatus, post sinum subrectus, canalibus pororum rectis, non ramosis (fig. 6, *b*).

Conchae supra infraque visae formam navicellae imitantes apice anteriore acuto, posteriore vero rotundato, lateribus minime arcuatis, fere subrectis, latitudine maxima in medio sita.

Valvulae concharum superficie splendida, concinne granulata, setosa, setis parvis, sat rare dispersis; colore viridi.

Longitudo concharum 1.2—1.3 mm.; altitudo maxima 0.6—0.65 mm.; latitudo maxima 0.43—0.48 mm.

Antennae, mandibulae, maxillae, pedes laminaeque furcales structura iisdem maris similes.

(*Mas*, fig. 6, *c-k*.)

Conchae ambae forma structuraque fere similes, reniformes, altitudine maxima longitudinem dimidiam non attingente, in margine anteriore, posteriore ventralique lamina hyalina carentes, canalibus pororum rectis, non ramosis, ubique fere aequalis (fig. 6, *c*).

Margo interior concharum altitudine posteriorem superante, regulariter acutiusculo arcuatus, in marginem dorsalem ventralemque sine limite visibili ineuns (fig. 6, *c*).

Margo dorsalis late arcuatus in marginem anteriorem posterioremque aequaliter flexuoso declinatus, sine limite visibili.

Margo posterior anteriore humilior acutiusculo arcuatus, in marginem dorsalem ventralemque sine limite visibilis ineuns.

Margo ventralis concharum in medio late sinuatus, ante et post sinum fere aequaliter subarcuatus.

Conchae supra vel infra visae formam navicellae imitantes, apice anteriore acuto, posteriore vero rotundato, latitudine maxima in medio sita (fig. 6, *d*); structura coloreque feminarum similes.

Longitudo concharum 1.05—1.1 mm.; altitudo maxima 0.45—0.5 mm.; latitudo maxima 0.4 mm.

Antennae primi paris articulo ultimo setis duabus aculeoque laevi, elongato armato.

Articulus proximalis endopoditi antennarum secundi paris fasciculo setarum natatoriarum perbrevium, evanescentium. Articulus penultimus in angulo superiore distali unguiculis apicalibus tribus, aequalibus, denticulatis. Articulus ultimus in apice unguiculo apicali, denticulato, aculeo laevi, unguiformi, seta bacilliformi sensoria setaque simplici parva (fig. 6, *e*).

Articulus ultimus palpi maxillaris longitudine latitudinem superante. Processus primus maxillae manducatorius in apice

aculeis duobus validis, laevibus. Pedes maxillares appendice branchiali 6 setosa, setis plumosis. Palpus pedis maxillaris dextri biarticulatus, articulo basali columniformi ubique fere aequilato, in angulo anteriore distali aculeis duobus diversis sensoriis; articulo ultimo fere falciformi, basi et in apice angustiore (fig. 6, *f*).

Palpus pedis maxillaris sinistri biarticulatus, articulo basali columniformi, ubique fere aequilato, in angulo anteriore distali aculeis duobus diversis; articulo ultimo fere falciformi, basi inflato, apicem versus sensim attenuato (fig. 6, *g*).

Pedes primi paris articulis duobus proximalibus superficie setosis, articulo antepenultimo in angulo anteriore distali setis duabus inaequalibus armato; ungue apicali longitudinem articulorum trium antecedentium superante.

Laminae furcales fere gladiiformes, margine posteriore vel superiore recto, dense setoso, setis minimis, margine anteriore vel inferiore sinuato; seta laterali unguiculo laterali valde approximata; unguiculo laterali longitudinem dimidiam unguiculi apicalis attingente; unguiculo apicali longitudinem dimidiam laminae furcalis multo non attingente; seta apicali longitudine dimidia unguiculis apicalis multo brevior (fig. 6, *k*).

Ductus ejaculatorius circum canalem centralem annulis 20 aculeorum (fig. 6, *h*).

Penis utcunque pyriformis appendice accessoria fere quadrangulari, apicem distalem versus dilatata. Vas deferens laqueos multos formans (fig. 6, *i*).

Specimina numerosa ♀ et ♂ examinavi e localitate *Mang-tsa* collecta.

Species haec nova in honorem D. F. H. *Stewarti*, denominata differt forma structuraque concharum, ductus ejaculatorii penisque a speciebus ceteris generis.

(19) *Herpetocypris smaragdea*, n. sp.

(Fig. 7, *a-d*.)

Conchae ambae structura formaque similes, a latere visae fere reniformes, altitudine maxima dimidiam longitudinem attingente; margine anteriore, posteriore ventralique lamina hyalina, canalibusque pororum carentibus.

Margo anterior concharum fere altitudine posterioris, latiusculo arcuatus, in marginem dorsalem ventralemque sine limite visibili ineuns (fig. 7, *a*).

Margo dorsalis late arcuatus, antice posticeque flexuosus, in marginem posteriorem sine limite visibili ineuns.

Margo posterior acutiusculo rotundatus, in marginem ventralem sine limite visibili flexuose ineuns.

Margo ventralis in medio late sinuatus, ante et post sinum parum arcuatus.

Conchae supra aut infra visae elongato oviformes, antice acutius

quam postice rotundatae, lateribus late arcuatis; latitudine maxima in medio sita (fig. 8, *b*).

Valvulae concharum politae, laeves; colore viridi.

Longitudo concharum 1.25 mm.; altitudo maxima 0.6 mm.; latitudo maxima 0.55 mm.

Articulus ultimus antennarum primi paris setis duabus longis aculeoque elongato, setiformi, laevi.

Articulus basalis endopoditi antennarum secundi paris fasciculo setarum 5 breviorum natatoriarum evanescente, dimidiam, longitudinem articuli sequentis parum attingene. Articulus penultimus in angulo superiore distali unguiculis 3 aequilongis, validis, denticulatis setisque duabus longis.

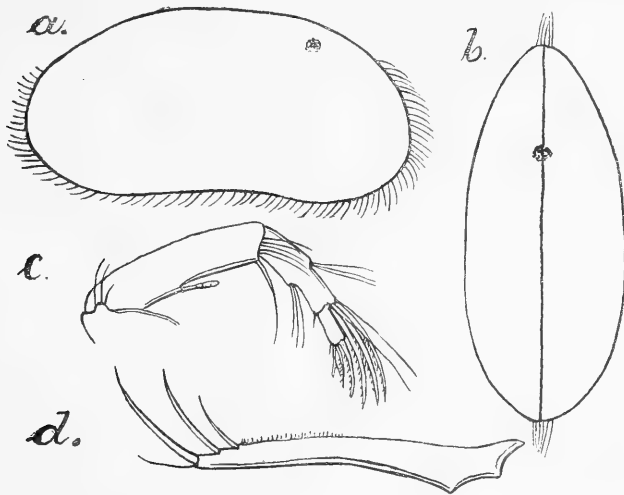


FIG. 7.—*Herpetocypris smaragdea*, n. sp.

(a) Concha dextra a latere visa.

(b) Conchae supra visae.

(c) Endopoditum antennae secundi paris.

(d) Lamina furcalis.

Articulus ultimus in apice unguiculis duobus diversilongis, denticulatis, seta bifissa sensoria setaque parva simplici (fig. 7, *c*).

Palpus maxillaris articulo ultimo longiore quam latiore. Processus manducatorius primus in apice aculeis duobus laevibus, politis.

Palpus pedum maxillarium cuneiformis apice trisetoso, setis brevibus. Appendix branchialis setis 6 plumosis.

Pedes primi paris articulis duobus proximalibus in marginibus setosis. Articulus antepenultimus in angulo anteriore distali setis duabus inaequalibus. Unguis apicalis longitudinem articulorum trium antecedentium pedis superans, parum arcuatus.

Pedes secundi paris iisdem specierum ceterorum generis similes.

Laminae furcales apicem versus parum attenuatae, subrectae, margine posteriore setoso, setis minimis; seta laterali unguiculo

lateralis approximata, longitudinem dimidiam unguiculi lateralis superante; unguiculo laterali elongato, longitudinem dimidiam unguiculi apicalis multo superante; unguiculo apicali fere longitudine dimidia laminae furcalis; seta apicali longitudinem tertiam unguiculi apicalis non superante (fig. 7, *d*).

Specimen unicum ♀ examinavi e localitate *Rham-Tso*.

Species haec nova speciei *Herpetocypris stewarti* affinis, sed differt: forma structuraque concharum antennarumque secundi paris.

(20) *Potamocypris stewarti*, n. sp.

(Fig. 8, *a-c*.)

Conchae ambae structura formaque similes, a latere visae parum oviformes, altitudine maxima in medio concharum sita longitudinem dimidiam valde superante (fig. 8, *a*); margine anter-

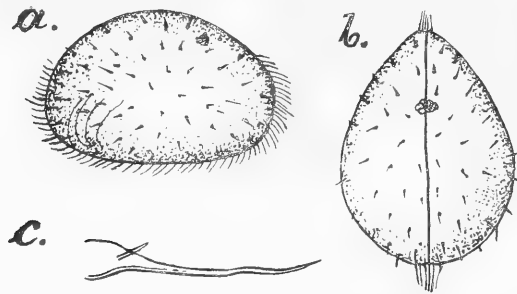


FIG. 8.—*Potamocypris stewarti*, n. sp.

- (*a*) Concha dextra a latere visa.
- (*b*) Conchae supra visae.
- (*c*) Lamina furcalis.

iore, posteriore ventralique lamina hyalina canalibusque pororum carentibus.

Margo anterior fere altitudine posterioris, obtuse arcuatus, in marginem dorsalem ventralemque sine limite visibili ineuns.

Margo dorsalis sat acute rotundatus, antice posticeque flexuose declinatus, in marginem posteriorem sine limite visibili ineuns.

Margo posterior acutiusculo arcuatus, marginem dorsalem versus flexuoso, marginem ventralem versus acutius rotundatus et in marginem ventralem sine limite visibili ineuns.

Margo ventralis leviter arcuatus, antice posticeque parum flexuosus (fig. 8, *a*).

Conchae supra aut infra visae ovo brevi, sat dilatato similes, apice anteriore acuto, posteriore vero sat obtuse rotundato, latitudine maxima post dimidium sita (fig. 8, *b*).

Valvulae concharum concinne granulatae, sparsim setosae, setis parvis; colore viridibrunneo.

Longitudo concharum 1 mm.; altitudo maxima 0.75 mm.; latitudo maxima 0.56 mm.

Exopoditum antennarum primi paris lobum parvum trisetosum formans seta mediana perlonga, apicem articuli ultimi fere attingente. Articulus primus endopoditi in parte distali infra setosus, fasciculo setarum natatoriarum apicem unguiculorum apicalium attingente. Articulus penultimus in angulo superiore distali unguiculis tribus apicalibus setisque duabus longis. Unguiculi apicales inter se diversi, duo aequilongi, tenue denticulati, alter brevior, parum latior, validiusque denticulatus. Articulus ultimus in apice unguiculis duobus inaequalibus denticulatis, seta sensoria bacilli-formi, setaque parva simplici.

Processus manducatorius maxillarum primus aculeis duobus laevibus, politis.

Pedes maxillares solum setis duobus branchialibus.

Pedes primi secundique paris iisdem specierum ceterorum generis similes.

Laminae furcales evanidae seta laterali brevi, processu flagelliformi apicali (fig. 8, c).

Specimen unicum ♀ examinavi e localitate *Gyantse*.

Species haec nova in honorem D. F. H. *Stewarti*, denominata differt forma structuraque concharum a speciebus ceteris generis.

#### HYDRACHNIDAE.

(21) *Eulais tibetana*, n. sp.

(Fig. 9, a-e.)

Corpus ovale, antice acutius, postice latius rotundatum, longitudine 2-3 mm., latitudine maxima 1.5—2 mm.

Integumentum corporis dense concinneque striatum.

Circuitus oculorum oviformes, antice posticeque aequaliter rotundati ponte elongato conjuncti. Pons conjungens longitudine 0.17 mm. margine anteriore posterioreque trituberculato, tuberculo medio majore, duobus lateralibus minoribus aequalibus, lamina adhaesionis musculorum sat magna, rotundata, setis sensoriis e tuberculis exeuntibus (fig. 9, a).

Capitulum breviusculum superficie granulata, in angulo posteriore utrinque processu retrorsum et a latere vergente sensim attenuato; margine posteriore prope basin processorum lateralium tuberculo parvo (fig. 9, c).

Sacculi tracheales longitudinem pharyngis non superantes (fig. 9, b).

Pharynx postice in lateribus processu parvo dentiformi (fig. 9, c).

Palpus maxillaris longitudine 1.2 mm. Articulus secundus in margine inferiore prope angulum setis duabus, latere externo laevi, latere interno in margine apicali setis 4 brevibus, aculeiformibus, setosis (fig. 9, b, d). Articulus tertius in latere exteriori et in margine distali seta aculeiformi pilosa (fig. 9, b), in latere interiori et in margine apicali setis 4 aculeiformibus pilosis (fig. 9, d). Articulus quartus in margine superiore inferioreque



4. Sars, G. O. . *On Freshwater Entomostraca of Sydney, Kristiania, 1896, tab. 1-8.*
5.     ,,     " *The Cladocera, Copepoda and Ostracoda of the Jana Expedition," Annuaire du Musée Zool. de l'Acad. imp. des Scienc. de St. Pétersbourg, 1898, p. 324, tab. 6-11.*
6.     ,,     " *On the Crustacean Fauna of Central Asia," Part 2, Cladocera, ibid., 1903, tom. 8, p. 157, tab. 1-8.*
7.     ,,     " *On the Crustacean Fauna of Central Asia," Part 3, Copepoda and Ostracoda, ibid., tom. 8, 1903, p. 195, tab. 9-16.*
8.     ,,     " *On the Crustacean Fauna of Central Asia," Appendix, ibid., p. 233.*
9. Schmeil, O. . *Deutschlands freilebende Süßwasser-Copepoden, I, Cyclopidæ, Cassel, 1893, tab. 1-8.*

REPORT ON THE FISH COLLECTED IN TIBET  
BY CAPT. F. H. STEWART, I.M.S.

By R. E. LLOYD, M.B., D.Sc., Capt., I.M.S.

*Acting Professor of Biology, Medical College, Calcutta, formerly  
Surgeon Naturalist, Marine Survey of India.*

This collection includes eight species, all of which were taken from the Nyang Chu, a stream of some magnitude, which flows by Gyantse and Shigatse to meet the Tsang-po. Of these species three are new to science. During the expedition of 1904 Captain H. J. Walton collected seven species of fish, of which no less than six were found by Mr. Tate Regan to be new species. As only two species, *Nemachilus stoliczkæ* and *Schizothorax macropogon*, are present in both collections, we may conclude that the waters of Tibet contain a considerable variety of fish.

*Nemachilus stoliczkæ*, Day.

Numerous specimens.

*Ptychobarbus conirostris*, Steindachner.

One specimen 175 mm. in length.

*Schizothorax macropogon*, Regan. (Pl. xxv, fig. 4.)

Three specimens measuring 26, 29 and 37 cms. They differ slightly from the described type of the species, which was from Lhasa.

The length of the head is only  $\frac{1}{5}$  of the total length, and the barbels are as long as the head excluding the snout.

*Schizopygopsis stoliczkæ*, Steindachner.

A very common fish in these waters (identified by Captain Stewart).

*Schizopygopsis stoliczkæ* (colour variety). Specimens were taken in which the pigment of the back was concentrated in stellate spots: this peculiarity had no dependence on illumination, age, or sex.

*Parexostoma stoliczkæ* (Day).

Two specimens, measuring 250 and 190 mm. respectively, have been referred to this species. They agree very closely in their proportions with certain of Day's specimens from Leh in Western Tibet. They differ, however, somewhat in that their heads are relatively larger and flatter. In colour they are olivaceous above, the pigment being arranged in a speckled manner on a yellow ground; below they are dull yellow.

*P. maculatum*, Regan, from Lhasa seems to resemble *P. stoliczkæ* very closely, except in colour. In this respect, however, our specimens from Gyantse appear to agree, judging from the descriptions, with the specimens from Leh more closely than with those from Lhasa.

In the specimens from Gyantse, the head length is more than  $\frac{1}{5}$  of the total length, the length of the snout is  $1\frac{1}{2}$  times the interocular distance as in *P. maculatum* and as in many of Day's type specimens (of *P. stoliczkæ*) from Leh.

In Day's description of this latter species, however, the length of the snout is said to be twice the distance between the eyes.

*Schizopygopsis stewartii*, n. sp. (Pl. xxv, fig. 1.)

The length of the head bears to the length of the body (without the caudal) the proportion of 1 : 4. The head is flattened above, the snout being conical and pointed, the point of the lower jaw and the snout reach to the same level. The diameter of the eye is to the length of the head as 1 : 7; to the length of the snout as 1 : 2. The length of the snout is slightly greater than the interocular distance.

The dorsal fin contains three spines and seven rays, the third ray is deeply serrated and is about as long as the postocular part of the head. The first spine is situated nearer to the root of the tail than to the end of the snout, the distances which separate these



points being in the proportion of 5: 6. By "root of the tail" is meant the point where the lateral line ends against the caudal fin.

The anal fin contains three spines and six rays, and nearly touches the caudal when laid flat.

The pectoral, pelvic, and anal fins very nearly of the same length, which is slightly less than the postocular part of the head.

There are 110—120 scales in the lateral line. Behind the operculum the scales are arranged in eight to ten rows, placed one above the other; in each row there are two to four scales, they are irregularly imbricated. The "tiled" row contains thirty to thirty-five scales, on either side of the vent the diameter of these scales is  $\frac{2}{3}$  that of the eye in front, and behind the vent their diameter becomes considerably less.

There are no barbels.

Pharyngeal teeth 4.3 | 3.4; the teeth of the outer row are longer than those of the inner and are curved.

*Colour*.—Silvery with dark uniformly distributed small blotches apparently under light control. Top of head dirty olive extending on to the cheek, dorsal and caudal fins dirty olive. Pelvic, ventral and anal fins orange-red near the free margin.

An active predatory fish; a small fish of another species was taken from the stomach of one of the specimens.

*Schizothorax o'connori*, n. sp. (Pl. xxv, fig. 3.)

Length of the head to the length of the body (without caudal) bears the proportion 1: 5.

The greatest depth of the body is a little more than the length of the head. The diameter of the eye is  $\frac{1}{6}$  of the length of the head. The eye is nearer to the snout than to the posterior border of the operculum, being separated by two diameters from the former and three diameters from the latter.

The diameter of the eye is to the length of the interocular distance as 2: 5.

The shape of the head is that of a bluntly pointed cone: between the eyes the head is nearly flat, but in the middle line a raised crest of the frontal bone projects slightly. (This may only be visible in the spirit specimen.)

The mouth is transverse and is only slightly curved. The snout projects well beyond the level of the lower jaw. The posterior barbel is in length about  $\frac{2}{3}$  of the diameter of the eye, the anterior barbel being somewhat less than this.

The dorsal fin is situated behind the level of the ventrals, its first spine is somewhat nearer to the root of the tail than to the snout, the proportion of the distances which separate these points being as 6: 7.

There are three spines and eight soft rays in the dorsal fin, the third spine being equal to the length of the head without the snout. In the character of this spine the two specimens differ considerably; in the larger specimen the serrations are distinct but small, and the

distal half of the spine is flexible, in the other the spine is much stouter, the serrations are longer and only the distal third is flexible.

The anal fin contains three feeble spines and seven soft rays; when laid flat it does not quite reach to the caudal.

L.L. 105—110,—L.tr. 25—1—25. The “tiled row” contains fifteen scales, each about  $\frac{3}{4}$  of the diameter of the eye. Pharyngeal teeth ten on either side, rows not regularly arranged.

*Colour*.—“Bluish above with steel-blue scales; sides yellow orange; belly white; upper surface of head dirty olive; cheeks golden.”

*Oreinus baileyi*, n. sp. (Pl. xxv, figs. 2, 2a.)

Length of head is to the length of the body (without caudal) as 1: 4. The head is scaleless, and conical in shape, the upper profile slopes downwards, but the lower profile is almost in a line with the ventral surface of the body. The diameter of the eye is to the length of the head as 1: 7.

The eye is to the snout in length as 2: 5.

The dorsal fin contains three spines and seven rays; the third spine is stout and deeply serrated posteriorly; it is jointed and flexible near the tip, and is as long as the postocular part of the head. The first dorsal spine is much nearer the root of the tail than to the snout. The distances which separate these points being in the proportion of 3: 4. The anal fin contains three feeble spines and six rays; when laid flat it does not quite touch the caudal.

The pectoral, pelvic, and anal fins are all very nearly of the same length and are equal to the length of the head excluding the snout.

The length of the caudal fin is equal to the greatest depth of the body.

Both upper and lower lips are very thick and fleshy, so that they appear as though covered by a mask.

The lower lip has a deep median notch which converts it into a horse-shoe-shaped sucker.

The maxillary barbel is as long as the lower lip, the rostral barbel is somewhat shorter.

Pharyngeal teeth 5.3.2 | 5.3.2.

Lateral line contains about 100 scales. The “tiled” row of scales contains about 23. The diameter of the largest of them is about  $\frac{3}{4}$  of the diameter of the eye.

*Colour*.—“Steel-blue, silvery, with a tinge of gold on the sides; back of the head is dirty olive, a tinge of gold on operculum; dorsal and caudal fin spotted with black; also irregular black spots over the body.”

DESCRIPTION OF THE TADPOLE OF *RANA*  
*PLESKII*, WITH NOTES ON ALLIED  
FORMS.

By N. ANNANDALE, D.Sc., Superintendent, Indian Museum.

The only species of Batrachian represented in Captain Stewart's collection is *Rana pleskii*, Günther, which has already been recorded from the neighbourhood of Gyantse by Boulenger (*Ann. Mag. Nat. Hist.* (7), xv, p. 378, 1905).

*Rana pleskii*, Günther.

*R. Pleskii*, Günther, *Ann. Mus. St. Petersb.*, 1896, p. 199.

Several adult specimens of various sizes, and tadpoles in various stages from the neighbourhood of Gyantse.

Boulenger (*op. cit.*) records this species from an altitude of 15,000 feet, and Captain Stewart tells me that it is abundant all about Gyantse, occurring even in small puddles of water and in mountain streams. Like its allies *R. vicina* and *R. liebigii* it appears to be mainly aquatic in its habits.

The fact that *R. pleskii* breeds at an altitude of 13,000 feet or over is interesting. There is a full-grown tadpole in Captain Stewart's collection which was taken in April at the height mentioned, and a very small frog taken in November at the same height. There are also several smaller tadpoles, all of which are unusually well preserved. The following description is drawn up from the largest tadpole, which has the hind legs about 10 mm. long but no signs of the fore limbs:—

Tadpole of *R. pleskii*, Günther—

Total length 72 mm.; length of tail 45 mm.; greatest breadth of body 13 mm.; depth of body 9 mm.; greatest depth of tail 12 mm.; of caudal muscles 8 mm. Head and body flat; eyes far apart, dorsal; nostril dorsal, a little nearer the tip of the snout than the eye; spiracle sinistral, pointing backwards and upwards; anus opening on the right side; caudal fin commencing well behind the level of the base of the hind limbs, continued round the tail to the anus, bluntly pointed at the tip. Lips moderately well developed, both with a fringe, which is only interrupted for a short distance in the middle of the upper lip; both jaws serrated at the edge and roughened on the external surface; the upper jaw bearing a couple of long, narrow teeth at either end; lower jaw crescentic,

undivided; dental formula  $\frac{3+3}{4+1}$ . Colour slate-grey, indistinctly marbled on the tail and fading to white on the belly.

For the sake of comparison I give a description of a somewhat similar tadpole which appears to be that of *R. vicina*, a frog found

above 6,000 feet in the Himalayas and common in the Simla district and in Kumaon. I have found this tadpole with the adult of the species to which I assign it both in Kumaon and in the Simla hills:—

Tadpole of *Rana vicina*, Stoliczka—

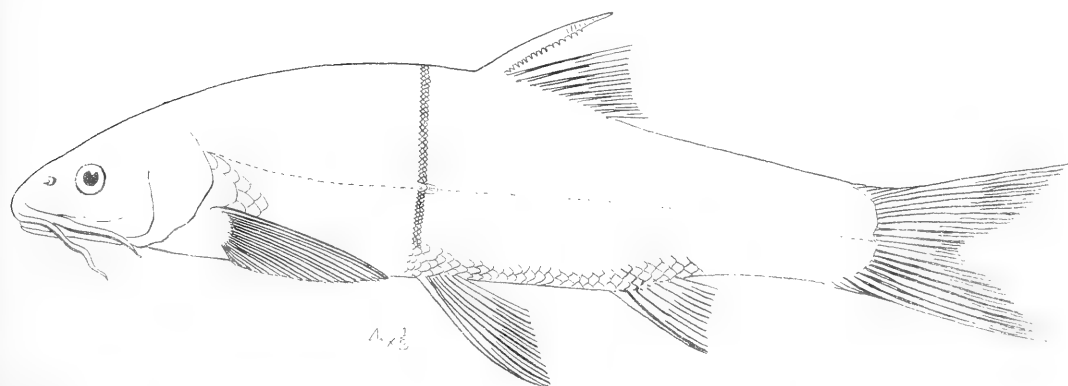
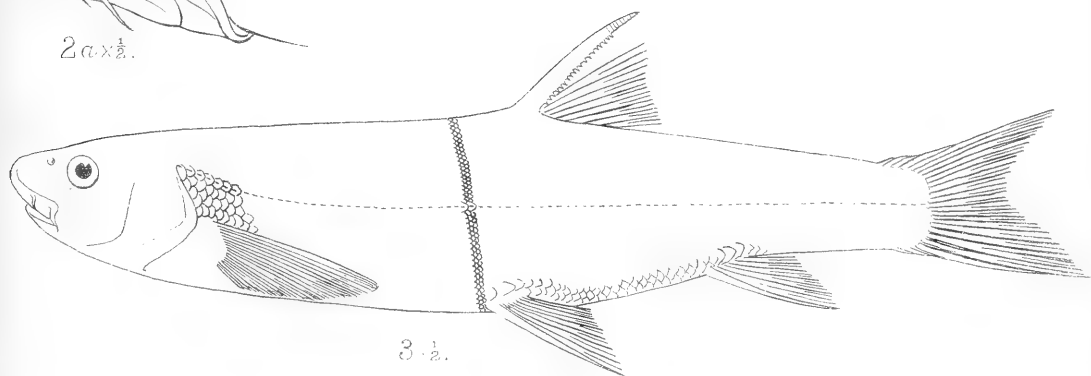
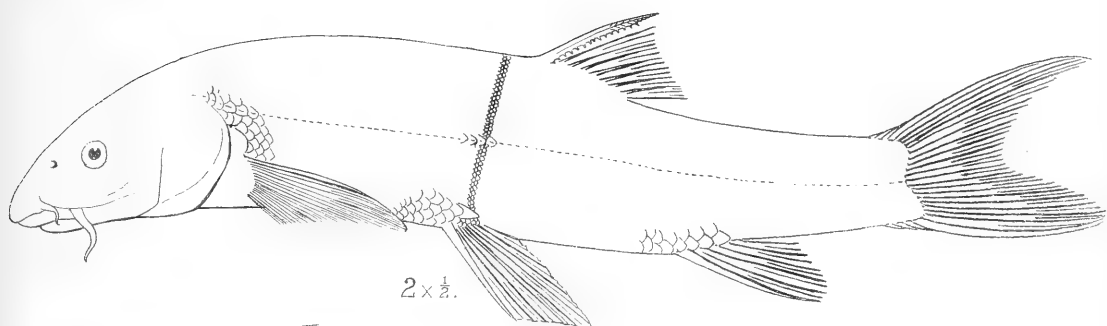
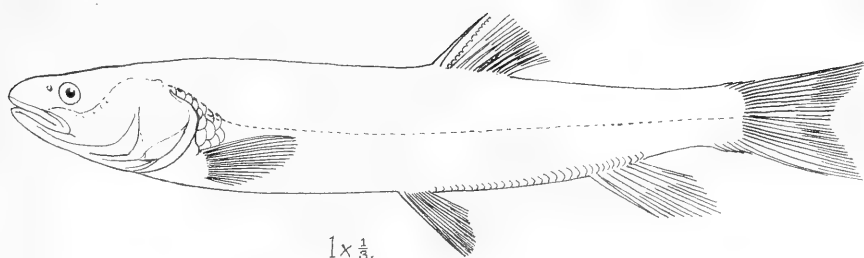
Total length (specimen without legs) 43 mm.; length of tail 30 mm.; greatest breadth of body 8 mm.; greatest depth of tail 8 mm.; of caudal muscles 5 mm. Head and body moderately flat; eyes far apart; nostrils nearer the eyes than the tip of the snout; eyes and nostrils dorsal; spiracle sinistral, pointing upwards and backwards; vent opening on the right side; caudal fin commencing in front of the base of the hind limbs, continued round the tail to the anus, sharply pointed at the tip. Lips very large, considerably larger than those of the tadpole of *R. pleskii*, resembling those of *R. liebigii* in extent; the lower lip fringed completely, the upper lip only at the corners; both jaws serrated; upper jaw in two parts, without enlarged teeth at the sides; dental formula

$$\frac{1}{\frac{3+4}{1+1}}$$

; a minute, round papilla, bearing horny teeth, exists on either side between the uppermost row and the first of the double rows on the upper lip. Colour brownish, more or less distinctly mottled and spotted, paler below.

The dental formula of the tadpole of *R. liebigii* (Annandale, *Journ. Asiat. Soc. Bengal*, 1906, p. 290) is  $\frac{3}{\frac{5+5}{1+1}}$ ; otherwise the larva of this species is much like that of *R. vicina*.









F. H. Stewart, Photo.

Survey of Litha cliffs - Ca.

TWO VIEWS OF THE RAM-TSO FROM THE NORTH.





XXXII. NOTES ON ACULEATE HYMENOPTERA IN THE INDIAN MUSEUM.

PART I.

By COLONEL C. T. BINGHAM.

From time to time during the last two years Dr. Nelson Annandale, Superintendent of the Indian Museum, Calcutta, has been good enough to send me for determination small collections of Aculeate Hymenoptera contained in the Indian Museum. A list of these, with descriptions of the new forms, is given in the following paper.

**TUBULIFERA.**

Family CHRYSIDIDÆ.

*Holopyga indica*, Mocsáry.

*Holopyga indica*, Mocs., Mon. Chrys., 1889, p. 118, ♀ ; Bingham, Faun. Brit. Ind. Hym., ii, 1903, p. 422.

*Hab.*—Burma : Rangoon.

Apparently widely spread. I took it at Delhi, Nurse in Rajputana.

*Ellampus timidus*, Nurse.

*Ellampus timidus*, Nurse, Entom., xxxv, 1902, p. 305, ♀ ♂ ; Bingham, Faun. Brit. Ind. Hym., ii, 1903, p. 42, pl. 1, fig. 11, ♀ .

*Hab.*—Assam : Margherita.

As widespread as the last. The single ♀ in the collection agrees entirely with a specimen sent me by Col. Nurse, taken in Baluchistan.

*Hedychridium wroughtoni*, du Buysson.

*Hedychridium wroughtoni*, du Buyss., Jour. Bomb. N. H. Soc., x, 1896, p. 466, pl. 2, fig. 6, and pl. 5, fig. 4 ; Bingham, Faun. Brit. Ind. Hym., ii, 1903, p. 425.

*Hab.*—Nepal : Soondrijal ; Oudh : Lucknow.

Originally described from Central India.

*Chrysis mendicalis*, Cameron.

*Chrysis mendicalis*, Cam., Mem. Manch. Lit. and Phil. Soc., xli, 1897, p. 4 ; Bingham, Faun. Brit. Ind. Hym., ii, 1903, p. 451.

*Hab.*—Purneah.

Originally described from Barrackpore.

*Chrysis triacantha*, Mocsáry.

*Chrysis triacantha*, Mocs., Mon. Chrys., 1889, p. 325; Bingham, Faun. Brit. Ind. Hym., ii, 1903, p. 453.

*Hab.*—Bengal: Purneah, Calcutta.

Extends to Ceylon and the Malayan subregion.

*Chrysis nitidula*, Fabricius.

*Chrysis nitidula*, Fabr., Syst. Ent., 1775, p. 359; Mocs., Mon. Chrys., 1889, p. 347.

*Hab.*—Assam: Margherita.

Of very wide distribution in both hemispheres. Not, however, recorded from India before.

*Chrysis fuscipennis*, Brullé.

*Chrysis fuscipennis*, Brullé, Hist. Nat. Ins. Hym., iv, 1846, p. 38; Mocs., Mon. Chrys., 1889, p. 370; Bingham, Faun. Brit. Ind. Hym., ii, 1903, p. 467.

*Hab.*—Purneah, Siliguri, Calcutta, Perso-Baluch Frontier.

A common form throughout India.

*Chrysis angustata*, Mocsáry.

*Chrysis angustata*, Mocs., Termész. Füzetek, xv, 1892, p. 225; Bingham, Faun. Brit. Ind. Hym., ii, p. 469.

*Hab.*—Purneah.

Occurs also in Upper Burma: Mandalay and Maymyo.

*Chrysis obliterata*, Mocsáry.

*Chrysis obliterata*, Mocs., Termész. Füzetek, xi, 1887, p. 15; *id.*, Mon. Chrys., 1889, p. 377; Bingham, Faun. Brit. Ind. Hym., ii, 1903, p. 460.

*Hab.*—Baluchistan.

Taken also in various parts of northern, central, and western India.

*Chrysis cupreiventris*, Bingham.

*Chrysis cupreiventris*, Bingham, Jour. Bomb. N. H. Soc., xii, 1898, p. 117, ♀; *id.*, Faun. Brit. Ind. Hym., ii, 1903, p. 465.

*Hab.*—Himalayas: Phagu near Simla.

*Chrysis sarakhensis*, Radoszkowski.

*Chrysis sarakhensis*, Radoszk., Rev. d'Ent., x, 1891, p. 195; Bingham, Faun. Brit. Ind. Hym., ii, 1903, p. 475.

*Hab.*—Bengal: Saraghat.

Has a wide range from Central Asia to Western India and Burma.

*Chrysis bengalensis*, Mocsáry.

*Chrysis bengalensis*, Mocs., Mon. Chrys., 1889, p. 527, ♀ ;  
Bingh., Faun. Brit. Ind. Hym., ii, 1903, p. 482.

*Hab.*—Bengal : Purneah.

Recorded before from Bombay and Madras.

*Chrysis lusca*, Fabricius.

*Chrysis lusca*, Fabr., Syst. Piez., 1804, p. 171; Mocs., Mon.  
Chrys., 1889, p. 527, ♂ ♀ ; Bingh., Faun. Brit. Ind. Hym., ii, 1903,  
p. 484, pl. i, fig. 2.

*Hab.*—United Provinces; Bengal : Murshidabad.

Occurs throughout India, Ceylon and Burma.

*Chrysis orientalis*, Guérin.

*Pyria orientalis*, Guér., Rev. Zool., 1842, p. 146, ♂.

*Chrysis orientalis*, Mocs., Mon. Chrys., 1889, p. 592; Bingh.,  
Faun. Brit. Ind. Hym., ii, 1903, p. 485.

*Hab.*—Bengal : Calcutta.

Spread generally throughout India, but not as yet recorded  
from Assam or Burma.

*Chrysis indica*, Mocsáry.

*Chrysis indica*, Mocs., Mon. Chrys., 1889, p. 591; Bingh.,  
Faun. Brit. Ind. Hym., ii, 1903, p. 486.

*Hab.*—Bengal : Purneah.

Fea obtained it in Upper Burma.

*Chrysis oculata*, Fabricius.

*Chrysis oculata*, Fabr., Syst. Ent., 1775, p. 357; Mocs., Mon.  
Chrys., 1889, p. 543; Bingh., Faun. Brit. Ind. Hym., ii, 1903,  
p. 488, pl. i, fig. 15.

*Hab.*—Bengal : Purneah.

Extended throughout India, Ceylon, Assam and Burma.

*Stilbum cyanurum*, Förster.

*Chrysis cyanurum*, Först., Nov. Spec. Ins., 1771, p. 89; Mocs.,  
Mon. Chrys., 1889, p. 190, pl. 2, figs. 3, 4 and 16; Bingh., Faun.  
Brit. Ind. Hym., ii, 1903, p. 433, pl. i, fig. 6.

*Hab.*—Bengal : Purneah.

Of world-wide distribution.

## FOSSORES.

## Family MUTILLIDÆ.

*Mutilla sex-maculata*, Sevederer.

*Mutilla sex-maculata*, Seved. (*nec* Smith), Nouv. Act. Holm.,  
viii, 1787, 286; Rad. and Sich., Hor. Soc. Ent. Ross., vi, 1869,  
p. 246.

*Hab.*—Rampur, Bijnor, Meerut, Burdwan, Purneah.

A very variable form generally distributed throughout India.

*Mutilla indefrusa*, Cameron.

*Mutilla indefrusa*, Cam., Mem. Manch. Lit. and Phil. Soc., xli, 1897, p. 62.

*Hab.*—Lucknow.

*Mutilla interrupta*, Olivier.

*Mutilla interrupta*, Oliv., Encycl. Méth., viii, 1823, p. 62 ; Bingham, Faun. Brit. Ind. Hym., i, 1897, p. 14.

*Hab.*—Purneah.

Spread throughout India, Assam and Burma, extending to China.

*Mutilla pilosella*, Magretti.

*Mutilla pilosella*, Magr., Ann. Mus. Civ. Genova, xxii, 1892, p. 220, ♂ ; Bingham, Faun. Brit. Ind. Hym., i, 1897, p. 45.

*Hab.*—Burma : Rangoon.

Described originally from Upper Burma. ♀ unknown.

*Mutilla ruficrus*, Magretti.

*Mutilla ruficrus*, Magr. (Radoszkowski MS.), Ann. Mus. Civ. Genova, xxii, 1892, p. 205 ; Bingham, Faun. Brit. Ind. Hym., i, 1897, p. 14.

*Hab.*—Bengal : Port Canning.

Not recorded before from Continental India.

*Mutilla lathonia*, Cameron.

*Mutilla lathonia*, Cam., Mem. Manch. Lit. and Phil. Soc., xlv, 1900, p. 18.

*Hab.*—Calcutta, Bareilly.

*Mutilla vicinissima*, Gribodo.

*Mutilla vicinissima*, Grib., Ann. Mus. Civ. Genova, xiv, 1884, p. 13 ; Bingham, Faun. Brit. Ind. Hym., i, 1897, p. 13.

*Hab.*—Calcutta.

Described originally from Upper Burma.

*Mutilla spectra*, form nov.

♀. Apical half of the mandibles, the clypeus, antennæ, legs and abdomen, black ; the base of the mandibles, the head and thorax, dark red. The head in front and above, the thorax above, and the abdomen, clothed with stiff, erect, black hairs ; the mouth parts below the base of the antennæ, the occiput, the thorax on the sides, the legs, and the spots and bands on the abdomen, covered with golden yellow pubescence, inclining to ferruginous on the legs, the spines on which are distinctly dark ferruginous. The pubescent

markings on the abdomen are as follows: Above: a spot in the middle of the basal segment, three round spots in a transverse row close to but not actually on the base of the second, a medially interrupted broad band on the third, and a lateral spot on the fourth segment; beneath: the second, third and fourth segments fringed with stiff yellow hairs, anal segment similarly fringed on the sides and below. Head rounded, narrower than the thorax, coarsely and deeply punctured; clypeus very short, anteriorly crenulate; antennæ robust, the second joint of the flagellum slightly longer than the third or fourth; eyes oval, prominent; occiput slightly arched. Thorax subrectangular, convex, strongly tuberculate at the sides, above very coarsely and deeply punctured, the intervals between the punctures running into longitudinal coarse striæ; seen from above slightly narrower posteriorly than anteriorly, its posterior face vertical, distinctly concave. Abdomen massive, oval, longer than the head and thorax united; pygidial area convex, very delicately transversely striate; ventral carina on the basal segment short, deep, wedge-shaped, entire.

*Length*.—♀, 13 mm.

*Hab*.—Oncha near Naini Tal, United Provinces.

A very distinct form not closely resembling any Indian form known to me. In size and general shape not unlike *M. pulchrina*, Smith, but abundantly different in sculpture and markings. Like Smith's species, the pygidial area is convex and finely transversely striate, and the ventral carina wedge-shaped, short and deep.

*Mutilla indiga*, form nov.

♂. Head, postscutellum, median segment, legs and abdomen black; pro- and mesonotum and scutellum red; sides of the thorax and pectus black; antennæ dull golden brown, tips of the mandibles and the antennal tubercles red; pubescence silvery white, dense, and long on the face and front of the head and on the legs, shorter on the thorax and at base of and beneath the abdomen; on the last it forms distinct fringes along the apical margins of segments 1 to 3. Head orbicular, very slightly narrower than the thorax; pronotum long, posterior margin deeply arched; mesonotum convex, parapsidal furrows deep and well marked; scutellum and postscutellum short and laterally compressed; median segment long, strongly convex and gradually sloped posteriorly; abdomen subpetiolate, broad at base of second segment, gradually but quickly narrowed to the apex. Head, thorax and abdomen shining; head and thorax anteriorly finely and somewhat sparsely punctured; median segment more closely punctured with wide shallow reticulations; abdomen finely, somewhat closely and regularly, punctured. Wings fusco-hyaline; tegulæ large, black and shining; veins brown.

*Length*.—♂, 8; *exp.* 16 mm.

*Hab*.—Jhansi, N.-W. India.

Superficially resembles *Mutilla (Odontomutilla) herpa*, Cameron, from Sarawak, but structure, shape of median segment, and sculpture, all differ widely.

Family SCOLIIDÆ.

*Iswara luteus*, Westwood.

*Iswara luteus*, Westwood, Trans. Ent. Soc. Lond., 1850, p. 233, pl. 7, figs. 5, 5a—5f; Bingham, Faun. Brit. Ind. Hym., i, 1897, p. 55.

*Tiphia himalayensis*, Cameron.

*Tiphia himalayensis*, Cam.

*Hab.*—Nepal: Chandragiri.

*Scolia quadripustulata*, Fabr., var. *binotata*, Fabricius.

*Scolia binotata*, Fabr., Syst. Piez., i, 1804, p. 244; Bingham, Faun. Brit. Ind. Hym., i, 1897, p. 84.

*Hab.*—Ceylon.

Throughout India, Assam, Burma and Ceylon.

*Elis prismatica*, Smith.

*Scolia prismatica*, Smith, Cat. Hym. Brit. Mus., iii, 1855, p. 102, ♀; *Elis prismatica*, Sauss. and Sich., Cat. Scol., 1864, p. 190; Bingham, Faun. Brit. Ind. Hym., i, 1897, p. 98.

*Hab.*—Himalayas: Simla, Phagu, Matiana, 8,000 ft.; Mussoorie 7,000 ft.; Darjiling 7,000 ft.

Found also in Burma, Tenasserim, China.

*Elis ceylonica*, Kirby.

*Campsomeris ceylonica*, Kirby, Trans. Ent. Soc. Lond., 1889, p. 452; *Elis ceylonica*, Bingham, Faun. Brit. Ind. Hym., i, 1897, p. 94.

*Hab.*—Nepal.

Described originally from Ceylon.

Family POMPILIDÆ.

*Pseudagenia alaris*, Saussure.

*Agénia alaris*, Sauss., Novara Reise Hym., 1867, p. 52.

*Pseudagenia alaris*, Cam., Mem. Manch. Lit. and Phil. Soc. (4), iv, 1891, p. 436; Bingham, Faun. Brit. Ind. Hym., i, 1897, p. 117.

*Hab.*—Calcutta.

Found also in Sikhim, Ceylon, Burma and Tenasserim.

*Pseudagenia lævicula*, Bingham.

*Pseudagenia lævicula*, Bingham, Faun. Brit. Ind. Hym., i, 1897, p. 118.

*Hab.*—Burma: Rangoon.

Described originally from Tenasserim.

*Pseudagenia culiciformis*, form. nov.

♂. Uniform black. Head and thorax anteriorly covered with short, erect, soft whitish hairs, those on the cheeks posteriorly form a fringe. Head, pronotum, mesonotum, the sides of the thorax and the abdomen above very minutely and closely punctured; scutellum and postscutellum obliquely finely striate; median segment more coarsely punctured than the thorax, with a granular appearance. Wings hyaline, nervures brown, stigma jet black. Head lenticular, from in front orbicular; clypeus convex, as broad as long; antennæ long, thick and densely pubescent; second, third and fourth joints of the flagellum subequal; face in front slightly convex, vertex strongly arched, ocelli much closer to each other than are the posterior ones to the eyes. Thorax and median segment slightly compressed, narrow, together half as long again as the abdomen; pronotum comparatively long, the sides anteriorly convergent, its posterior margin angularly arched; mesonotum convex; scutellum laterally compressed; median segment very long, gently sloped to apex, rounded and convex; legs long, slender, tibiæ entirely without spines. Abdomen short, fusiform, subpetiolate, with a trace of a transverse furrow on the second ventral segment.

*Length*.—♂, 6; *exp.* 13 mm.

*Hab.*—Kumaon: Naini Tal, 6,400 feet.

*Pseudagenia invidiosa*, form nov.

♀. Black, covered all over with fine, short, white down, head and thorax very minutely and delicately aciculate; median segment finely transversely striate; abdomen very minutely and somewhat sparsely punctured, shining, the apical margins of all the segments very narrowly brownish testaceous. Head somewhat wider than the thorax; mandibles almost hidden under the clypeus, their apices castaneous red; clypeus comparatively large, convex, anteriorly triangularly produced, carinate down the middle; antennæ comparatively stout, the second joint of the flagellum one-third longer than the third, the latter slightly longer than the fourth; front convex, sloping upwards to the vertex; vertex transverse, the ocelli in an equilateral triangle closer to each other than are either of the posterior ocelli to the eyes; pronotum almost transverse anteriorly, broadly arched posteriorly; mesonotum slightly convex; scutellum, postscutellum and median segment declivous, the last rounded posteriorly and furrowed down the middle; legs stout, smooth or with only a few minute spines on the intermediate tibiæ; wings hyaline at base, fuscous towards their apices; abdomen subpetiolate, fusiform; sting well exerted.

*Length*.—♀, 8; *exp.* 17 mm.

*Hab.*—Soondrijal, Nepal.

Closest to *P. clypeata*, Bingh., from which it differs in the shape of the clypeus; that in *clypeata* is transversely suboval and has a conspicuous white macula on each side; the legs also are different in colour, being entirely black in the present form.

*Pseudagenia mimica*, form nov.

♀. Black, smooth and shining, sparsely clothed with somewhat long, soft, white hairs, which are most dense on the sides of the head behind the eyes and on the sides of the thorax and median segment; pronotum anteriorly with a rich purple prismatic sheen. Head and pronotum very sparsely and minutely punctured; mesonotum, scutellum and postscutellum very delicately aciculate; median segment furrowed medially from base, very obsoletely, transversely striate; abdomen smooth. Head broad, about twice as broad as long and much broader than the thorax; mandibles broad and stout; clypeus transversely oval, strongly convex, anterior margin narrowly reflexed; antennæ short but slender, the second joint of the flagellum half as long again as the third or fourth; front convex, bearing a very narrow medial furrow from the anterior ocellus to between the base of the antennæ; the ocelli very close together, the space between them barely half that between the lateral ocelli and the eyes; vertex broad, transverse. Thorax comparatively short, the pronotum transverse anteriorly, angularly arched posteriorly; mesonotum, scutellum, and postscutellum convex; median segment rounded, with an oblique slope posteriorly; legs slender, smooth; wings hyaline; nervures dark brown. Abdomen fusiform, about as long as the thorax and median segment, the second to the fifth segments in certain lights obsoletely banded along their posterior margins with silvery pile.

♂. Similar, smaller and more slender, the purple tint on the pronotum and the obsolete transverse silvery bands on the abdomen absent.

*Length*.—♀, 9; ♂, 6: *exp.* ♀, 16; ♂, 13 mm.

*Hab.*—Himalayas: Mussoorie, 7,000 ft.

Its nearest ally is *P. stulta*, Bingham. It differs from that form in the much shorter prothorax and median segment, the finely aciculate mesonotum, the colour of the legs, etc.

*Salix (Priocnemis) rothneyi*, Cameron.

*Salix rothneyi*, Cam., Mem. Manch. Lit. and Phil. Soc. (4), iv, 1891, pp. 452 and 453; Bingham, Faun. Brit. Ind. Hym., i, 1897, p. 146.

*Hab.*—Sikkim: Darjiling.

Descends also to the plains, as it was originally taken at Barrackpore.

*Pompilus hecate*, Cameron.

*Pompilus hecate*, Cam., Mem. Manch. Lit. and Phil. Soc. (4), iv, 1891, pp. 458 and 462, pl. 3, fig. 8; Bingham, Faun. Brit. Ind. Hym., i, 1897, p. 171.

*Hab.*—Nepal.

This form also descends to the plains; described originally from Barrackpore.



*Pompilus iliacus*, Cameron.

*Pompilus iliacus*, Cam., Jour. Straits Asiatic Soc., xxxviii, p. 90.

*Hab.*—Nepal : Nagarkote.

The specimen is not typical, and it is possibly a closely allied new form.

## Family SPHEGIDÆ.

*Tachytes modesta*, Smith.

*Tachytes modesta*, Smith, Cat. Hym. Brit. Mus., iv, 1856, p. 299; Bingham, Faun. Brit. Ind. Hym., i, 1897, p. 190.

*Hab.*—Calcutta.

Probably spread throughout India, Burma, Siam and China.

*Lyroda formosa*, Smith.

*Morphota formosa*, Smith, Jour. Linn. Soc. Lond., 1859, p. 17, ♀.

*Lyroda formosa*, Kohl., Verh. Zool.-bot. Ges. Wien, 1884, p. 267; Bingham, Faun. Brit. Ind. Hym., i, 1897, p. 209.

*Hab.*—Lucknow; Calcutta.

Widely spread. Originally described from the Celebes.

*Pison punctifrons*, Shuckard.

*Pison punctifrons*, Shuck., Trans. Ent. Soc. Lond., 1837, p. 77, ♀; Bingham, Faun. Brit. Ind. Hym., i, 1897, p. 219.

*Hab.*—Purneah.

Spread sparingly throughout Continental India, Assam and Burma.

*Trypoxylon intrudens*, Smith.

*Trypoxylon intrudens*, Smith, Trans. Zool. Soc. Lond., vii, 1872, p. 188; Bingham, Faun. Brit. Ind. Hym., i, 1897, p. 224.

*Hab.*—Purneah.

Occurs apparently throughout Continental India, Assam, Ceylon, Burma and Tenasserim.

*Ammophila (Psammophila) tydei*, Le Guillon.

*Ammophila tydei*, Le Guillon, Ann. Soc. Ent. Fr., x, 1841, p. 319, ♀.

*Hab.*—Himalayas : Simla hills, Theog, 8,000 ft.

A remarkably wide ranging form found in Southern Europe, Northern Africa, through Western Central Asia, Baluchistan, the Himalayas, parts of Southern India, and the Malayan region to Australia.

*Sceliphron bilineatum*, Smith.

*Pelopæus bilineatus*, Smith, Ann. Mag. Nat. Hist. (2), ix, 1852, p. 47; Bingham, Faun. Brit. Ind. Hym., i, 1897, p. 238.

*Hab.*—Meerut.

Originally described from Western India.

*Gorytes icariiformis*, form nov.

♀ Black: the anterior and lateral margins of the clypeus, a line gradually broadened anteriorly along the lower half of the inner orbits, and the scape anteriorly, bright sulphur-yellow. A line on the posterior margin of the pronotum, the apex of the femora, the tibiæ and tarsi of the anterior and intermediate legs, the knees and basal portions of the tibiæ of the posterior legs, the swollen globular portion of the first abdominal segment above, a broad band along the apical margin of the second abdominal segment and narrower similar bands on the third and fourth segments orange-red; the bands on the second and third segments continued narrowly on the ventral side. Head and thorax anteriorly closely, very finely punctured, opaque; a deep transverse groove with a number of short, longitudinal carinations between mesonotum and scutellum; median segment with a large basal triangular area coarsely longitudinally ridged and with a conspicuous medial short longitudinal sulca, which is divided into little quadrate areas by short transverse carinæ; rest of median segment coarsely sculptured, somewhat irregularly reticulate. Abdomen smooth and shining, a deep crenulated constriction between the first and second segments. Head transverse, nearly as broad as the thorax; mandibles narrow, acute at apex; clypeus transverse, convex in the middle, about twice as broad as high, the sides oblique, the anterior margin transverse, reflexed; antennæ short and slender, opaque, second flagellar joint twice the length of third; face slightly concave, inner orbits of the eyes parallel; vertex transverse. Thorax short and massive, the mesonotum slightly convex, broader than long; legs stout, posterior tibiæ with a few blunt, short spines; claws simple; wings hyaline, ample, fore and hind wings anteriorly shaded with fuscous nervures, brown. Abdomen longer than the thorax, first segment petiolate at base, apex suddenly enlarged and globose above as in most of the forms of the social wasps belonging to the genus *Icaria*.

*Length*.—♀, 11; *exp.* 23 mm.

*Hab.*—India.

The single specimen of this beautiful and very distinct form sent to me unfortunately has no particular locality on its label.

*Philanthus pulcherrimus*, Smith.

*Philanthus pulcherrimus*, Smith, Cat. Hym. Brit. Mus., iv, 1856, p. 469; Bingham, Faun. Brit. Ind. Hym., i, 1897, p. 299.

*Hab.*—Jullundur, Ferozepore, Agra.

Widely distributed in Continental India.

*Philanthus (Trachypus) nepalensis*, form nov.

♂. Black with yellow markings. Head: a triangular mark on the clypeus, a crescentic spot above it between the base of the antennæ, an oval spot above that, a spot on the front of the scape,

a broad stripe on the sides of the face along the lower half of the inner orbits, and a large spot behind the eyes, yellow. Thorax: a line on the pronotum, a spot on the tegulæ anteriorly, the tubercles, a spot on the mesopleuræ in front, a transverse oval mark on the scutellum, a similar smaller mark on the postscutellum, and a spot on either side of the median segment at apex, yellow. Legs: the apex of the femora and the tibiæ in front and the basal joints of the tarsi of the anterior and intermediate legs, and the knees and basal joints of the tarsi of the posterior legs yellow. Abdomen: a large oval spot edged anteriorly with dark red on either side of the second segment at apical margin, and a waved line on the apical margins of the third, fourth and fifth segments, with a transverse medial spot on the apical margin of the sixth segment, yellow; ventrally there are short, yellow, lateral lines on the apical margins of the second and third segments. Head, thorax, and base of first abdominal segment densely punctured, granular; rest of the abdomen with a few very fine scattered punctures. Head broader than the thorax; mandibles stout, longitudinally grooved; clypeus and face in front slightly convex; antennæ short, opaque; second joint of flagellum four times as long as the third. Thorax oval; mesonotum large, convex; median segment rounded posteriorly, medially furrowed from base, the furrow not reaching the apex; legs slender, the tibiæ with a few minute spines; wings clear hyaline; nervures brown. Abdomen: the basal segment petiolate, long, about half the length of the rest of the abdomen, convexly swollen at apex.

*Length*.—♂, 11; *exp.* 20 mm.

*Hab.*—Nepal: Katmandu.

This form is nearest to *P. punjabensis*, Nurse, but can be distinguished as follows:—

- (a) Head sparsely punctured; clypeus bisinuate; first and second abdominal segment with broad, oval, lateral, yellow spots .. *P. punjabensis*.
- (b) Head closely punctured, granular; clypeus arched, not bisinuate anteriorly; only second segment with broad, oval, lateral, yellow spots .. .. *P. nepalensis*.

#### *Cerceris pictiventris*, Dahlbom.

*Cerceris pictiventris*, Dahlb., Hym. Eur., i, 1845, p. 498; Bingham, Faun. Brit. Ind. Hym., i, 1897, p. 305.

Var. *Cerceris ferorus*, Smith, Ann. Mag. Nat. Hist. (4), xii, 1873, p. 411.

*Hab.*—Central India: Mhow.

Found throughout India, Assam, Ceylon, Burma and Tenasserim, extending as far as Java in the Malayan region. The specimen is var. *ferorus*, Smith.

*Cerceris tetradonta*, Cameron.

*Cerceris tetradonta*, Cam., Mem. Manch. Lit. and Phil. Soc. (4), iii, 1890, pp. 250, 261, pl. 10, fig. 12; Bingham, Faun. Brit. Ind. Hym., i, 1897, p. 304.

*Hab.*—Purneah.

Originally described from Poona.

*Cerceris hilaris*, Smith.

*Cerceris hilaris*, Smith, Cat. Hym. Brit. Mus., iv, 1856, p. 452. ♀; Bingham, Faun. Brit. Ind. Hym., i, 1897, p. 311.

*Hab.*—Himalayas: Mussoorie.

Probably found throughout Continental India.

*Cerceris vigilans*, Smith.

*Cerceris vigilans*, Smith, Cat. Hym. Brit. Mus., iv, 1856, p. 454; Bingham, Faun. Brit. Ind. Hym., i, 1897, p. 308.

*Hab.*—Calcutta.

Common.

*Crabro annandali*, form nov.

♀. Black, a short streak anteriorly near apex of scape of antennæ, a transverse band on the pronotum, the tegulæ of the wings anteriorly, the apices of all the femora, broad transverse bands along the bases of abdominal segments 2 and 5, and small lateral spots at the bases of segments 3 and 4, red. The band on the second abdominal segment posteriorly emarginate in the middle, the lateral spots on the fourth segment very small. Pubescence, erect, black on the head and thorax anteriorly, soft and whitish on the median segment and base of the abdomen; clypeus covered with dense silvery short pile. Head large, quadrate, broader than the thorax, very densely and minutely punctured, opaque; clypeus convex, transverse, shining, with a few scattered punctures; eyes very broad anteriorly, suddenly and strongly narrowed towards the vertex; seen from the front the inner orbits are widely divergent towards the vertex; antennæ comparatively short and robust; a deep fovea between the eyes above the base of the antennæ, which is continued as a shallow impressed line almost to the anterior ocellus; ocelli in an equilateral triangle; vertex and the cheeks behind the eyes very broad, the former almost flat. Thorax: pronotum transversely impressed in the middle; deep transverse sulci between the mesonotum and scutellum, between the scutellum and postscutellum, and between the last and the median segment, which last sulcus is margined anteriorly by a slender shining carina, the ends of which are turned downwards; median segment convex, steeply sloped, marked by a deep and comparatively broad medial furrow from base to near apex, crossed about midway by a transverse narrower furrow. The thorax anteriorly densely punctured like the head,

the median dull and opaque but with only scattered fine punctures. Legs: stout, the posterior femora studded with two rows of short thick spines. Wings: light brownish hyaline; nervures brown. Abdomen minutely aciculate, dull and opaque except the basal segment which is smooth and shining above.

*Length*.—♀, 15; *exp.* 31 mm.

*Hab.*—Himalayas, 9,000 ft., north of Taunghi.

This very distinct form superficially resembles *C. melanotarsis*, Cam., from the Khasi Hills, but in the latter the legs are more or less red; there is only one transverse red stripe on the abdomen, and that is on the third, not the second abdominal segment; and the sculpture of the median segment is entirely different.

## DIPLOPTERA.

### Family EUMENIDÆ.

*Odynerus ovalis*, Saussure.

*Odynerus ovalis*, Sauss., Mon. Guêp. Sol., 1852, p. 215; Bingham, Faun. Brit. Ind. Hym., i, 1897, p. 369.

*Hab.*—Ferozepore.

Throughout the plains of India.

### Family VESPIDÆ.

*Polybia stigma*, Smith.

*Polybia stigma*, Smith, Jour. Linn. Soc. Lond., 1858, p. 114; Bingham, Faun. Brit. Ind. Hym., i, 1897, p. 384.

*Hab.*—Burma: Rangoon.

A common form in Burma, extending to Borneo.

*Polistes marginalis*, Fabricius.

*Vespa marginalis*, Fabr., Syst. Ent., 1775, p. 367; Sauss., Mon. Guêp. Soc., 1853-1858, p. 62, pl. 6, fig. 2.

*Hab.*—Himalayas: Simla; Nepal: Katmandu.

A very widespread form. The Himalayan form or variety is very dark.

*Vespa flaviceps*, Smith.

*Vespa flaviceps*, Smith, Trans. Zool. Soc. Lond., vii, 3, 1870, p. 191, pl. 21, figs. 10 and 11; Bingham, Faun. Brit. Ind. Hym., i, 1897, p. 406.

*Hab.*—Himalayas: Simla hills.

At low elevations in Sikhim, also found in the hills of Tenasserim.

*Vespa auraria*, Smith.

*Vespa auraria*, Smith, Trans. Ent. Soc. Lond., 1852, p. 46, pl. 8, fig. 8, ♀; Bingham, Faun. Brit. Ind. Hym., i, 1897, p. 407.

*Hab.*—Himalayas: Simla.

Found also in the hills of Tenasserim.

*Vespa structor*, Smith.

*Vespa structor*, Smith, Trans. Zool. Soc. Lond., vii, 3, 1870, p. 191, pl. 21, fig. 12; Bingham, Faun. Brit. Ind. Hym., i, 1897, p. 404.

*Hab.*—Himalayas: Simla.

Extends also to the Sikkim Himalayas.

Family APIDÆ.

*Halictus albescens*, Smith.

*Halictus albescens*, Smith, Cat. Hym. Brit. Mus., i, 1853, p. 61; Bingham, Faun. Brit. Ind. Hym., i, 1897, p. 423.

*Hab.*—Calcutta; Rajmahal; Himalayas: Simla, Matiana; Agra; Katmandu.

Widely distributed and variable.

*Halictus subopacus*, Smith.

*Halictus subopacus*, Smith, Cat. Hym. Brit. Mus., i, 1853, p. 63, ♀; Bingham, Faun. Brit. Ind. Hym., i, 1897, p. 428.

*Hab.*—Darjiling, Kurseong.

I took it in Upper Burma.

*Halictus polycctor*, form nov.

♀. Black; the head, pronotum and median segment opaque; the mesonotum, scutellum, postscutellum and the bases of the abdominal segments highly polished and shining. Head, thorax and abdomen with long, soft, white pubescence shorter and recumbent on the face in front and forming transverse narrow bands that are more or less posteriorly emarginate at the bases of abdominal segments 2 to 5. Head flat in front, closely punctured; clypeus slightly produced, truncate anteriorly; eyes with the inner orbits concavely arched and slightly convergent anteriorly. Thorax short, sparsely punctured above; median segment slightly compressed, truncate posteriorly, the enclosed space at base somewhat coarsely punctured, rugose. Wings hyaline, iridescent. Legs, slender, pubescent, on the posterior four legs the pubescence long, the calcaria yellow. Abdomen as long as the head and thorax united; segments 2 to 5 distinctly, finely, but sparsely punctured, each strongly constricted at base. Anal rima ferruginous.

*Length.*—♀, 6; *exp.* 13 mm.

*Hab.*—Himalayas: Theog near Simla, 8,000 ft.

A more slender and smaller insect than *H. constrictus*, Smith, its nearest ally.

*Halictus deiphobus*, form nov.

♀. Black. Head, thorax, legs, and abdomen, laterally and beneath with abundant, soft, erect, greyish or fuscous white pubescence; abdomen with comparatively broad whitish pubescent bands at the bases of segments 2 to 4; anal rima black. Head, thorax, and abdomen very minutely and densely punctured but not opaque, slightly shining; on the apex of the clypeus the punctures are larger and more scattered. Head about as wide as the thorax; clypeus broader than long, abruptly truncate anteriorly; antennæ short, opaque, bare; third, fourth, and fifth joints of the flagellum subequal, second joint twice the length of either of them; face flat; vertex arched; eyes wide apart, their inner orbits parallel; ocelli large and prominent, placed in a curve. Thorax short; mesonotum strongly convex, with a short impressed line above each tegula; median segment very short, evenly rounded posteriorly and vertical, the enclosed space at base very large, reticulate, punctate; legs very stout, the femora and tibiæ more thickly pubescent than the thorax, the intermediate and posterior calcaria ferruginous; wings hyaline, the nervures and stigma light brown. Abdomen as long as or a little longer than the head and thorax united, segments 1 to 4 with a medial transverse impression more or less obsolete in the middle but well marked on the sides.

*Length*.—♀, 8.9; *exp.* 14-16 mm.

*Hab.*—Himalayas: Simla hills, Matiana, 8,000 ft.

Differs from *H. vishnu*, Cam., in the abdominal segments being closely punctured right up to the margin, which is glabrous in *vishnu*, and from *H. buddha*, Cam., in the margins of the abdominal segments not being constricted, and in the head and thorax, though closely punctured, not being opaque. It differs also in the colour of the legs. *H. vishnu* and *H. buddha* were described from males, and it is quite possible that one of them may be the ♂ of the present form.

*Halictus lucidipennis*, Smith.

*Halictus lucidipennis*, Smith, Cat. Hym. Brit. Mus., i, 1853, p. 62, ♀; Bingham, Faun. Brit. Ind. Hym., i, 1897, p. 435.

*Hab.*—Kumaon: Bhim Tal; Simla hills: Theog.

*Halictus senescens*, Smith.

*Halictus senescens*, Smith, New Sp. Hym. Brit. Mus., 1879, p. 30; Bingham, Faun. Brit. Ind. Hym., i, 1897, p. 438.

*Hab.*—Mussoorie hills: Landour.

Generally distributed in India and Burma.

*Halictus paris*, form nov.

♀. Black, more or less shining. Head, thorax, legs, and the abdomen laterally and beneath clothed with short, erect, pale yellow pubescence, the abdomen probably in fresh specimens

with transverse bands of similar but shorter and recumbent pubescence on the apical margins of segments 1 to 4 (in the type and only specimen available, these bands are more or less abraded); anal rima black, apex of abdomen with ferruginous pubescence. Head, thorax and abdomen minutely punctured, the punctures dense on the front of the head and the vertex, and on the thorax, above and on the sides, more scattered on the clypeus anteriorly and on the abdomen above. Head broader than the thorax, lenticular, posteriorly widely emarginate; clypeus convex, broader than long, its anterior margin transverse; antennæ short, stout, opaque, second joint of flagellum shorter than the third; ocelli in a curve just below the vertex; vertex arched. Thorax short; mesonotum convex; scutellum broad, wedge-shaped, truncate posteriorly; postscutellum sunk, densely pubescent; median segment compressed, vertical posteriorly, the enclosed space at base finely and very densely punctured, separated from the postscutellum by a sharp, curved, shining carina; legs stout, black beneath, rufous above on the femora, tibiæ and tarsi; wings hyaline; nervures and stigma pale brown. Abdomen shining, the margins of the segments where the pubescence is abraded, rufo-testaceous.

*Length*.—♀, 8; *exp.* 17 mm.

*Hab.*—Himalayas: Simla hills, Theog, 8,000 ft.

A race or representative form of the European *H. calceatus*, Scopoli, from which it differs in being much narrower in shape and somewhat smaller. The enclosed space at the base of the median segment in the European form is much more coarsely punctured, and has the sides of that segment rugulose and not smooth and shining.

*Anthrena floridula*, Smith.

*Andrena floridula*, Smith, Second Yarkand Mission, Hym., p. 2, fig. 4 of plate; Bingham, Faun. Brit. Ind. Hym., i, 1897, p. 444.

*Hab.*—Himalayas: Simla hills, Phagu, Theog, 8,000 ft.

*Anthrena moris*, Brullé.

*Andrena moris*, Brullé, Exped. Sc. Morea, Zool., ii, 1832, p. 353, pl. 49, figs. 8, 9.

Var. *Andrena lugubris*, Erichs., M. Wagner, Reise in Algeria, iii, 1840, p. 191, ♀ ♂.

*Hab.*—Himalayas: Simla hills, Matiana, 8,000 ft.

A solitary specimen quite indistinguishable from specimens from Northern Africa.

*Anthrena brunneipennis*, form nov.

♀. Black, densely pubescent. The pubescence pale yellow on the head, the front and sides of the thorax, and on the abdomen, very long, tufted and hoary on the thorax posteriorly and on the



median segment, and short, very dense and rich ferruginous on the tibiæ and tarsi, and on the apical two abdominal segments. Wings hyaline, basally stained or clouded with brown, this colour reaching up to the apices of the radial cubital and discoidal cells; the last joint of the tarsi of the anterior and intermediate and the whole of the tarsi of the posterior legs rufo-ferruginous. Head about as broad as the thorax, the mandibles large, acute; clypeus large, convex, punctured, and with a medial, ill-defined, vertical carina, anteriorly transversely truncate. Thorax massive, finely punctured underneath the pubescence; median segment rounded posteriorly, with a not very steep slope to the apex. Abdomen somewhat depressed, long, not so densely pubescent as the thorax, the pubescence hoary and arranged more or less in transverse bands as fringes at the apical margins of the segments; the surface beneath the pubescence, where it is sparse, lightly and sparsely punctured and more or less shining.

*Length*.—♀, 15-16; *exp.* 28-31 mm.

*Hab.*—Himalayas: Simla hills, Matiana, 8,000 ft.

Nearest to probably a race of the European *A. nigroænea*, Kirby, but larger; the colour of the pubescence and of the wings different.

*Anthrena burkelli*, form nov.

♀. Black, the second and succeeding joints of the flagellum of the antennæ, and the apical four joints of all the tarsi, red. Head and thorax more or less densely, abdomen very sparsely, pubescent. The pubescence round the base of the antennæ and on the front rich dark brown, in striking contrast to that on the sides of the face and clypeus and on the back of the head, which is hoary, as is that on the thorax, the median segment and abdomen; pubescence on the legs shorter, denser, and ferruginous. Head, thorax, and median segment very finely and sparsely punctured, enclosed space at the base of the median segment more densely and coarsely punctured. Abdomen very minutely, densely punctured, opaque; apical margins of segments 1 to 4 smooth, pale yellowish, testaceous, that colour preceded by an obscure, transverse, narrow red band. Head as wide as the thorax; mandibles stout, polished, smooth, and shining; clypeus nearly circular, very convex, medially vertically carinate, and strongly, though not very closely, punctured; antennæ stout, rugulose, second joint of the flagellum as long as the succeeding three joints united. Thorax rather long; mesonotum convex; median segment rounded, somewhat oblique at the sides, its posterior face steeply sloped, truncate, and slightly concave; legs robust; wings hyaline; nervures and tegulæ testaceous. Abdomen oval, about as long as the thorax and head united.

*Length*.—♀, 12; *exp.* 23 mm.

*Hab.*—Himalayas: Simla hills, Matiana, 8,000 ft.

A very distinct form not closely allied to or resembling any form known to me.

*Anthrena mollis*, Smith.

*Anthrena mollis*, Smith, Desc. New Spec. Hym. Brit. Mus., 1879, p. 50; Bingham, Faun. Brit. Ind. Hym., i, 1897, p. 446.

*Hab.*—Jhansi.

A very variable and generally distributed form.

*Anthrena sodalis*, Cameron.

*Anthrena sodalis*, Cam., Mem. Manch. Lit. and Phil. Soc., xli, 1897, p. 121.

*Hab.*—Calcutta (?), Darjiling.

Described originally from Mussoorie.

*Anthrena gracillima*, Cameron.

*Andrena gracillima*, Cam., Mem. Manch. Lit. and Phil. Soc., xli, 1897, p. 118, pl. 4, fig. 19; Bingham, Faun. Brit. Ind. Hym., i, 1897, p. 444.

*Hab.*—Darjiling, Calcutta (?).

Described originally from Mussoorie.

*Anthrena mephistophelica*, Cameron.

*Andrena mephistophelica*, Cam., Mem. Manch. Lit. and Phil. Soc., xli, p. 117; Bingham, Faun. Brit. Ind. Hym., i, 1897, p. 443.

*Hab.*—Mussoorie.

Probably spread throughout the Himalayas above 6,000 feet.

*Nomia elliotii*, Smith.

*Nomia elliotii*, Smith, Trans. Ent. Soc. Lond., 1875, p. 44; Bingham, Faun. Brit. Ind. Hym., i, 1897, p. 449.

*Hab.*—Calcutta.

The plains of India generally; Burma; Tenasserim.

*Nomia westwoodi*, Gribodo.

*Nomia westwoodi*, Grib., Bull. Soc. Ent. Ital., 1894, p. 128; Bingham, Faun. Brit. Ind. Hym., i, 1897, p. 449.

*Hab.*—Calcutta.

*Nomia punctulata*, Dalla Torre.

*Nomia punctata*, Westwood (*nec* Smith), Trans. Ent. Soc. Lond., 1875, p. 213, ♀ ♂.

*Nomia punctulata*, Dal. Torre, Cat. Hym. (Apidæ), x, 1896, p. 169.

*Hab.*—Calcutta.

Not recorded before from India. Originally described from China.

*Nomia clypeata*, Smith.

*Nomia clypeata*, Smith, Trans. Ent. Soc. Lond., 1875, p. 54, pl. 2, fig. 18; Bingham, Faun. Brit. Ind. Hym., i, 1897, p. 456.

*Hab.*—Lucknow.

*Nomia floralis*, Smith.

*Nomia floralis*, Smith, Trans. Ent. Soc. Lond., 1875, p. 58; Bingham, Faun. Brit. Ind. Hym., i, 1897, p. 453.

*Hab.*—Calcutta.

Found also in Burma. A very variable form as to the amount of red on the abdomen.

*Osmia adæ*, Bingham.

*Osmia adæ*, Bingham, Faun. Brit. Ind. Hym., i, 1897, p. 468.

*Hab.*—Himalayas: Simla, Phagu.

*Megachile lanata*, Fabricius.

*Apis lanata*, Fabr., Syst. Ent., 1775, p. 385.

*Megachile lanata*, Bingham, Faun. Brit. Ind. Hym., i, 1897, p. 483.

*Hab.*—Cawnpore.

Spread throughout India.

*Megachile umbripennis*, Smith.

*Megachile umbripennis*, Smith, Cat. Hym. Brit. Mus., i, 1853, p. 175; Bingham, Faun. Brit. Ind. Hym., i, 1897, p. 483.

*Hab.*—Calcutta.

Found also in Tenasserim.

*Megachile albifrons*, Smith.

*Megachile albifrons*, Smith, Cat. Hym. Brit. Mus., i, 1853, p. 180; Bingham, Faun. Brit. Ind. Hym., i, 1897, p. 487.

*Hab.*—Agra.

Probably spread throughout the plains of India.

*Megachile nana*, Bingham.

*Megachile nana*, Bingham, Faun. Brit. Ind. Hym., i, 1897, p. 487.

*Hab.*—Agra, Ferozepore.

I procured it in Tenasserim in the dry Dipterocarpus scrub on more or less bare rocky hills.

*Ceratina hieroglyphica*, Smith.

*Ceratina hieroglyphica*, Smith, Cat. Hym. Brit. Mus., ii, 1854, p. 226; Bingham, Faun. Brit. Ind. Hym., i, 1897, p. 503, pl. 4, fig. 3.

*Hab.*—Mussoorie.

Very widely spread.

*Ceratina bhawani*, form nov.

♀. Black and shining, the bases of the mandibles, a large quadrate spot on the labrum, an irregular, very broad,  $\perp$  shaped mark on the clypeus, an oblong mark on either side of the face along the middle of the inner orbits, a transverse line on the pronotum, the tubercles, and the calcaria of all the tibiae of the legs yellowish white; very narrow transverse bands along the junctions of the first and second, second and third, and third and fourth abdominal segments dull castaneous. Head, smooth and polished; thorax, with the exception of the postscutellum, very sparsely and finely punctured; postscutellum and abdomen quite as finely but much more closely punctate; the enclosed space at base of the median segment very minutely but very densely punctured and rugulose. Head broader than the thorax, with the hollows round the bases of the antennae and on the face above characteristic of *Ceratina*; antennae short, stout; second, third, and fourth joints of the flagellum subequal. Thorax short, with medial and sublateral, short, longitudinally impressed lines; median segment compressed, rounded, and vertical posteriorly. Legs stout. Wings ample, hyaline; nervures and stigma very dark brown; tegulae testaceous. Abdomen long, massive, longer than head and thorax united.

*Length*.—♀, 8; *exp.* 17 mm.

*Hab.*—Himalayas: Simla hills, Theog 8,000 feet.

*Allodape parvula*, Smith.

*Allodape parvula*, Smith, New Spec. Hym. Brit. Mus., 1879, p. 98; Bingham, Faun. Brit. Ind. Hym., i, 1897, p. 507.

*Hab.*—Jubbulpore.

*Heriades parvula*, Bingham.

*Heriades parvula*, Bingham, Faun. Brit. Ind. Hym., i, 1897, p. 508.

*Hab.*—Mhow.

I procured it in Burma.

*Habropoda magretti*, Bingham.

*Habropoda magretti*, Bingham, Faun. Brit. Ind. Hym., i, 1897, p. 523.

*Hab.*—Ferozepore.

*Habropoda krishna*, form nov.

♂. Black. Head, thorax, and abdomen densely covered with long, pale brownish yellow pubescence turning to ferruginous golden on the posterior segments of the abdomen, and mixed throughout with a sprinkling of black hairs, the surface beneath more or less closely and finely punctured. Head: mandibles white; apical

third rich castaneous; base black; clypeus white; apical margin narrowly castaneous; sutures at the sides and above narrowly black. Thorax: the wings hyaline; nervures and tegulæ testaceous. Legs: apical joints of the tarsi rufo-testaceous; claws black. Head as wide as the thorax; the vertex broad, depressed; antennæ comparatively long, second joint of the flagellum attenuate at base, clavate at apex, as long as the succeeding three joints; ocelli in equilateral triangle, the distance between the anterior and either of the posterior ocelli greater than either of the posterior ocelli and the eye next to it; eyes large, prominent, their inner orbits parallel. Thorax globose; mesonotum convex, scutellum and postscutellum slightly raised, median segment short, vertical at the sides and to the apex. Abdomen subcordate, short, very convex above.

In some specimens not so densely pubescent as others, the pubescence forms distinct transverse bands on the apical margins of the segments beneath which the surface is rufo-testaceous. Female unknown.

*Length*.—♂, 12-13; *exp.* 24-27 mm.

*Hab.*—Sikhim: Darjiling, 7,000 ft.

Nearest to *H. radoszkowskii*, but differs in sculpture and in colour of pubescence.

*Podalirius quadrifasciatus*, Villers.

*Apis quadrifasciata*, Villers, Linn. Ent., iii, 1789, p. 319.

*Anthophora quadrifasciata*, Bingham, Faun. Brit. Ind. Hym., i, 1897, p. 529.

*Hab.*—No locality on label.

*Podalirius pulcherrimus*, Bingham.

*Anthophora pulcherrima*, Bingham, Faun. Brit. Ind. Hym., i, 1897, p. 532.

*Hab.*—Simla, Matiana, above 7,000 ft.

*Bombus hæmorrhoidalis*, Smith.

*Bombus hæmorrhoidalis*, Smith, Trans. Ent. Soc. Lond., 1852, p. 43; Bingham, Faun. Brit. Ind. Hym., i, 1897, p. 554.

*Hab.*—Himalayas: Simla; Subathu; Dhurrampur, 5,000 ft. Originally described from China.

*Bombus tunicatus*, Smith.

*Bombus tunicatus*, Smith, Trans. Ent. Soc. Lond., 1852, p. 43, pl. 8, fig. 7; Bingham, Faun. Brit. Ind. Hym., i, 1897, p. 549.

*Hab.*—Himalayas: Simla hills, Theog, Matiana, Phagu, 8,000 ft.

Originally described from China.

*Bombus flavescens*, Smith.

*Bombus flavescens*, Smith, Trans. Ent. Soc. Lond., 1852,  
p. 45; Bingham, Faun. Brit. Ind. Hym., i, 1897, p. 550.

*Hab.*—Himalayas: Taunghi, 9,000 ft.

### XXXIII. INDIAN PSYCHODIDÆ.

By E. BRUNETTI.

Until *Phlebotomus argentipes* was described by Dr. Annandale and myself in an earlier number of this Journal (vol. ii, p. 101), no species of this family had been described from the East. I therefore now offer descriptions of fourteen Indian species, the types of which are in the Indian Museum collection.

For the common Calcutta species, *Psychoda bengalensis*, I was about to erect a new genus, the flagellum of the antenna apparently consisting of only ten instead of thirteen or fourteen joints, but on a microscopic examination of fresh specimens, thirteen joints are plainly visible, the last three being exceedingly small. This fact I had overlooked, but the oversight was pointed out to me by Dr. Annandale; to which gentleman I desire to express my thanks for a considerable amount of assistance in the microscopic examinations in this group, and especially in the study of the genital apparatus; for it is mainly due to help thus received that I have had the courage to attack this family at all.

Many of the species herein characterised will be fairly easily recognised by some character found in none of the others. Many of them are described from the females only, but the sexes do not appear to differ, in those species of which both are known, except in the generative organs.

These organs in the male are apparently more or less uniformly shaped in all the species, consisting (in those species before me, in which this sex is present) of two pairs of appendages, the lower pair much the larger, and clothed with dense, long hairs. In the female this apparatus also appears very uniformly shaped in all the species, and consists of a moderately large, scythe-like, chitinous appendage, evidently capable of erection or depression, also of protrusion or withdrawal, for in some specimens it is erect, in others horizontal, and in others not visible at all. Dr. Annandale found that upon pressure from above, it is seen to be formed of two symmetrical valves, and below it are two very small, single-jointed, palpus-like organs, apparently springing from a common base. These I have not observed in all the species, but they are probably present.

In *Phlebotomus* no ovipositor is visible. I do not touch upon *Phlebotomus*, however, in this paper, as Dr. Annandale is occupied with a study of the Indian species of this genus.

## TABLE OF SPECIES.

*Psychoda*, Latr.

(Third longitudinal vein running straight to wing-tip.)

- A Wings with numerous, distinct scales, in addition to ordinary pubescence.
- B No white spots on wing-border .. *squamipennis*.
- BB White spots on wing-border.
- C Brown species; legs mainly brown .. *argenteopunctata*.
- CC Coal-black species; legs black .. *atrisquamis*.
- AA Wings without scales but clothed with hairs.
- D Wing-border with black or white spots, or both.
- E Spots at end of veins black only.
- F Greyish yellow species. Wings with seven black spots at tips of veins, and no scale-spots along the costa .. *bengalensis*.
- FF Black and white species. White scale-spots along the black costa .. *albonigra*.
- EE Spots at end of veins formed of white scales.
- G Tips of veins with silvery white hair-spots *albonotata*.
- GG Tips of veins with black hair-spots and with white intermediate spots .. *distincta*.
- DD Wing-border unspotted.
- H Wing covered uniformly with blackish grey hairs .. .. *nigripennis*.
- HH Wing crossed by a band of light brown hairs with one or more areas of white hairs .. .. *vittata*.

*Pericoma*, Wlk.

(Wing-tip occurs between lowest branch of second vein, and the third vein.)

- A Lower fork of fourth vein with an appendix at base.
- B First joint of flagellum long, with several long spines .. .. *spinicornis*.
- BB First joint of flagellum normal, unspined *appendiculata*.
- AA Lower fork of fourth vein without appendix.
- C Wing wholly jet-black, with white tip, and five white spots on wing-border .. *annandalei*.
- CC Wing blackish grey, with black and grey spots.
- D A black hair-spot at end of each vein .. *margininotata*.
- DD The black hair patches irregularly placed on disc and border of wing .. *bella*.



N.B.—I retain all the species in the above two genera, which appear ample for the species in this sub-family, the genera proposed by the Rev. A. E. Eaton (*Entomologist's Monthly Magazine*, 1904, p. 55), appearing to me to be based upon insufficiently strong characters.

***Psychoda bengalensis*, mihi, sp. nov.**

♂ ♀. Bengal. Long. 1-1 $\frac{3}{4}$  mm.

*Body* entirely clothed with hair, varying from yellowish grey to whitish, and of a nature varying from soft long hairs to bristly ones, which latter on some parts, and around the tip of the abdomen, are distinctly scale-like. In certain lights some of the scale-like bristles appear blackish or even wholly black.

*Head*: Eyes black, with very large facets; frontal groove very narrow with long, greyish hair. Lower part of head covered with long hair. Antennæ fifteen-jointed; scape of two larger joints egg-shaped; the flagellum of ten joints of nearly uniform size, each shaped like a long-necked flask, and three further very minute joints, invisible except under a microscope. Each joint of the whole antenna bears a rather thick verticil of hairs. Palpi of four joints of equal length, with some hairs, last joint very thin, pointed.

The genital process in the male consists of a pair of small, bare, upper chitinous appendages, and a much larger and longer lower pair, densely covered with long hair. In the female it consists of a pair of very small, pointed, chitinous appendages forming a small ovipositor, which it is somewhat difficult to distinguish amidst the hair.

*Legs* of the same colour as the body, clothed rather thickly with concolorous scales, and with numerous black bristles, the former being thickest on the tibiæ and tarsi.

*Wings* with all the veins bearing a double row of hairs, pointing respectively anteriorly and posteriorly. The fork of the upper prong of the second longitudinal vein originates a little before the middle line of the wing; and the fork of the fourth longitudinal vein originates a little behind this middle line, but the linear space between the two forks varies in different specimens. A few black bristly hairs forming a small black spot occurs at the tip of each of the four veins *above* the third longitudinal (which is unmarked); also at the tip of the upper prong of the fourth, and at the tips of the fifth and seventh. These black hairs gradually become more scale-like towards the last spot, which is usually the deepest of all.<sup>1</sup> The whole border of the wing is thickly fringed with long blackish grey hair, which extends over the tegulæ also.

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<sup>1</sup> In some specimens there is a collection of black hairs showing a tendency to form an irregularly shaped spot at the base of the wing, and, more often, two similar vague spots, one below the costa, the other above the hind border, both near the base of the wing.

*Genitalia*: Superior appendages consisting of two sub-equal joints, the proximal joint cylindrical, often concealed in a vertical position in the body, distal joint sickle-shaped, its ventral edge being somewhat sinuous. Inferior appendages very long, arising from an elongated, broad ventral plate; themselves sickle-shaped, clothed with long, fine hairs at their base, and bearing very minute, straight bristles on their ventral surface, each appendage terminating in a single, short, flattened, almost triangular spinule.

*Described* from about fifty examples in good condition in the Indian Museum collection, taken chiefly on windows, both in Calcutta during January, 1908, and in Simla and neighbouring places in May of the same year. Specimens are also present from: *Bengal*; Calcutta (Jan., Feb., May, July, Aug., Oct., Dec.), Port Canning, Ganges delta (Dec.), Katihar, Purneah district (Oct.): *Oudh*; Lucknow (Jan., Feb., April): *Western Himalayas*; Simla (May), Kasauli (May), Dharampur (May), Naini Tal (May or June): *Eastern Himalayas*; Kurseong, Darjiling district (July), both sexes common on windows and in grass at Darjiling (21-ix to 2-x-1908): *Burma*; Rangoon (March), Moulmein, Tenasserim (March).<sup>1</sup>

***Psychoda distincta*, mihi, sp. nov.**

♀. Sylhet. Long.  $1\frac{1}{2}$  mm.

*Body* pale brownish yellow, entirely clothed with long, pale brownish yellow, bristly hair, with some concolorous elongated scales, and with a few black bristles here and there. The bristles are long, and become scale-like on the dorsum of the thorax and towards the tip of the abdomen, where, in the latter case, the black bristles are also more numerous.

*Head*: Eyes black, with dense, soft, pale yellowish grey hair between them. Antennæ sixteen-jointed; first joint of scape cylindrical, second spherical; flagellum of fourteen elongated, pear-shaped joints, each surrounded by numerous long hairs in the form of a rather thick irregular verticel.

*Legs* with numerous bristles, which are very long on the tibiæ, which, in addition, have short scales of the same colour lying rather close, and a circlet of rather long, scale-like bristles at the tips. The metatarsus, which is nearly as long as the four remaining sub-equal joints together, has a few irregular bristles, and the tarsi are covered by close-lying, pale yellowish white scales, giving a whitish appearance in certain lights.

*Wings*: The upper prong of the second longitudinal vein forks near the base, before one-third of the wing, and the fourth longitudinal vein forks at exactly one-third. All the veins seem to bear the usual double row of hairs, and the intervening spaces are also covered with brown hairs rather thickly. The basal half only of the wing is covered moderately closely with pale brownish yellow, semi-transparent elongated scales of rather small size. There is

a patch of black hairs at the tip of all the veins from the first to the lower fork of the fourth (inclusive), with a trace of a patch at the tip of the fifth; and a patch of white hairs appears between all these black patches; so that the border of the wing appears spotted alternately black and white, and is fringed along its entire length with close, long, light brown hair. The hair of the wing appears lighter or darker in different specimens, and according to the direction in which the light falls on it, a brilliant iridescence being at times visible.

*Described* from two specimens in the Indian Museum from Sylhet (Major Hall), 1-i-05 and 30-i-05, also from a third specimen mounted on a slide, in the same collection.

***Psychoda albonotata*, mihi, sp. nov.**

♀. Calcutta. Long. 1 mm.

*Body*: Ground colour black. Thorax and abdomen with whitish grey hairs which in certain lights appear silvery.

*Head*: Eyes black, facets large; interocular space light brown, filled with strong, rather long black bristles. Antennæ sixteen-jointed, light brown; two basal joints cup-shaped, rather short, with circlets of stiff black bristles; the flagellum of fourteen cup-shaped joints placed rather close together, and bearing the usual long hairs which are both thick and long. Palpi dark brown, hairy.

The *genital* apparatus appears to be a moderate-sized, bare, pointed, pale yellowish brown appendage, similar to that of this sex in other species.

*Legs* with livid yellow femora and tibiæ, the latter black towards the tips; tarsi brownish black, covered with close, brownish scales. The extreme tip of the tibiæ, of the metatarsus, and of the last tarsal joint, with a few brilliant, snow-white hairs.

*Wings* with the upper prong of the second longitudinal vein originating much before the fourth part of the total length of the wing; the fourth longitudinal vein bifurcates at about one-fourth of the wing. Ground colour dark grey, the veins with the usual double row of hairs, which are black, giving, with the long fringe of black hairs around the whole wing-border, a wholly black appearance to the wing. A silvery white spot formed by a few minute, very elongate, hair-like white scales, at the tip of all the veins, from the first to the sixth inclusive, nine spots altogether.

*Described* from a female in excellent condition in the Indian Museum collection, taken in Calcutta, 5-6-i-08.

*N.B.*—The general appearance of this species is that of a black *Psychoda* with nine snow-white spots on the wing-border, and with white spots on the legs. In certain lights nearly all parts of the body in turn appear more or less silvery white, including the black wing-fringe, the femora and tibiæ, and nearly the whole

of the pubescence on the body ; the wings also, in certain lights, present a beautiful iridescence.

A second example in the same collection, from Sylhet (Major Hall), 8-i-05, is apparently the same species. The hairs on the wing are golden brown, and those on the body more brownish than in the Calcutta specimen, whilst the white scales cover the whole of the metatarsus.

The antennæ are missing, and there are a few white, elongated, hair-like scales in the centre of the wing towards the base. The wing-fringe is golden brown on the distal half and black on the basal part of the costa and on most of the posterior margin.

On the dorsum of the abdomen are a few remaining short white scales, lying rather close to the surface, but there are no such scales in *albonotata*, yet as the general resemblance between the specimens is so great, I regard this latter as a possible variety, in preference to describing it as new.

***Psychoda albonigra*, mihi, sp. nov.**

♀ (?). Calcutta. Long. nearly 1 mm.

*Head*: Form and face with white bristly hair on upper part and black scaly bristles below. Antennæ with second joint of scape short, cup-shaped, both joints encircled by white scales; flagellum of fourteen distinct, pale yellow, flask shaped joints, and an additional very minute spherical one; each joint bearing a thick verticil of stiff greyish white hair. Palp black, with black bristly hair.

*Thorax* covered with thick, bristly greyish white hair, with some darker hairs intermixed.

*Abdomen* (damaged): Dirty yellow, with some black hairs.

*Legs*: Femora pale dirty yellow. Tibiæ with closely-placed black scales, with black bristles intermixed, and bearing, placed irregularly, isolated white scales and white bristles; the posterior pairs with rather long black hair behind: tips of tibiæ with a few white scales. Tarsi covered with black scales and a few bristles; the tips of the metatarsi and of the last joint, with a few white scales.

*Wings*: Very pale grey, nearly clear round the posterior border. The veins with the usual double row of blackish grey hairs, with some white, nearly erect hairs placed in irregular rows and patches about the middle of and (more abundantly) across the base of the wing. A small bunch of black, bristly hairs at the tip of each vein, and the costal border clothed nearly to the tip of the wing with stiff, black, bristly hairs; along which are placed, at shortly regular intervals, one or two small white scales. Towards the tip of the costa the wing-fringe becomes greyish, and from thence, round the border, nearly to the base, it is greyish white, rather long and thick. Near the base of the posterior margin the fringe becomes blackish grey.

The bifurcations of the upper branch of the second vein, and of the fourth vein, occur just before the middle of the wing.

*Described* from a perfect unique ♀ (?) in the Indian Museum collection, captured by Dr. Annandale in the Museum, 30-vii-08.

***Psychoda squamipennis*, mihi, sp. nov.**

♀. Calcutta. Long.  $1\frac{1}{4}$  mm.

*Body* blackish brown, with brownish grey hair, which appears much lighter when the light falls on it in a certain direction. Eyes black, large facets. Antennæ: first joint elongate, one-and-a-half times as long as the second, which is short and subspherical; both with some bristly hairs; flagellum of apparently only thirteen joints, which are cup-shaped, with a central cylindrical prolongation, each joint bearing a thick verticel of long, close, scale-like, light brownish grey hairs, in addition to some ordinary hairs on each joint; the last joint tapers to a point and may really be separable into two.

*Legs* with close, greyish pubescence, and some apparently irregularly placed bristles of various lengths; some stiff black ones on the metatarsus.

*Wings* with the surface between the veins closely covered with distinct, moderately large, brown scales, and both veins and the intermediate spaces covered with brown and black hairs. Border of wing with a fringe of long brown hairs, which appear grey in certain lights; and along the extreme edge of the wing is placed, here and there, a single, small, snow-white scale-like hair.

The example is apparently a ♀ as no trace of a genital appendage is visible, but from the manner the specimen is mounted, it is very difficult to see the body and legs.

*Described* from a unique ♀ in the Indian Museum collection, taken by Dr. Annandale in Calcutta, 5-viii-07.

***Psychoda argenteopunctata*, mihi, sp. nov.**

♀. Calcutta. Long. nearly 1 mm.

Considerably resembling *squamipennis*.

The antennæ have a flagellum of thirteen spindle-shaped joints, each bearing a thick verticel of hairs.

Mouth with rather long bristles; the four-jointed palpi are thin, moderately hairy, gradually tapering towards the tip; the second joint being twice as long as the first, the rest sub-equal. The genital appendage appears bare, conical, horny, upright. The legs are covered with brownish scales which, in certain lights, show a greyish white shimmer. The tibiæ have rather long hairs of irregular length, and a circlet of strong bristles of different lengths at the tip; the apical half of the metatarsus has some white scales.

*Wings*: The second longitudinal vein divides almost directly after its divergence from the third, and the prong forks at a quarter

the length of the wing. The first longitudinal vein ends at the centre of the costa; the third ends at the extreme, slightly blunted, tip of the wing; the fourth divides from apparently a common stem just below the divergence of the second and third; the fourth forking a little beyond the fork of the upper prong of the second; the seventh is curved downward at the tip. The wings have a small spot of snow-white scale-like bristles at the tip of all the veins (not always very distinct), and two rather larger, similar spots on the costa, one before the tip of the first longitudinal vein, and the other before the uppermost branch of the second longitudinal vein. The under side of the wing in certain lights shows a brilliant iridescence, due to numerous, scattered, small scales of variegated colours.

In all remaining points, as in *squamipennis*, but a very distinct species.

*Described* from one ♀ in the Indian Museum collection taken in Calcutta, 27-viii-07.

***Psychoda atrisquamis*, mihi, sp. nov.**

♀. Calcutta. Long.  $1\frac{1}{4}$  mm.

Very near *squamipennis* and *argenteopunctata*. The wings are almost entirely clothed with soft black hairs, and the basal and central portions with thick black scales which, in certain lights, and from the under side view, appear partly iridescent. At the tip of each vein is a small bunch of snow-white, moderately long, scale-like hairs. The legs are almost wholly black, with a few small white scales at the tip of the tibiæ, and (at least, on the hind pair) a few at the tips of the metatarsus and succeeding joint.

Type (a perfect unique ♀) in the Indian Museum, taken on a window of the Museum building by Dr. Annandale, 22-vii-08.

*N.B.*—It is possible that this may be identical with *argenteopunctata*, as, though they appear quite distinct when viewed side by side, it is difficult to specify any strong point of difference, except that this species is coal-black, whilst *argenteopunctata* is brownish.

***Psychoda nigripennis*, mihi, sp. nov.**

♂ ♀. Himalayas (Simla and Darjiling districts); Bengal. Long.  $\frac{2}{3}$  to  $1\frac{1}{2}$  mm.

*Body* yellow, wholly covered with greyish brown hair, which in certain lights appears whitish.

*Head*: Eyes jet-black, facets very large. Antennæ; basal joints short and not broader than the flagellum, yellow, with some black bristles; second joint spherical; flagellum of fourteen joints, of which the first ten are flask-shaped (as in *bengalensis*); the eleventh has no "neck," and is roughly ovate; the twelfth, thirteenth and fourteenth are very minute, the two former cup-shaped, the terminal joint spherical. The verticels of greyish white hair on each

joint are very thick, lying closely, directed forwards and clustering together, thus giving the antenna the usual appearance of an organ of solidity, with parallel sides, of a grey colour, marked with small, black, round spots. Palpi of four elongated cylindrical joints, hairy, of equal length, except that the fourth is slightly longer and pointed at the tip.

*Legs* pale blackish brown; the femora with some white hairs below, the tibiae rather closely covered with snow-white hairs, the tarsi blacker, with white hairs which, towards the tip, are replaced by small, elongated white scales.

*Wings*: These have the appearance of being pale blackish, but are really pale grey, wholly unmarked; the veins distinct, each with the usual double row of hairs, which appear black when viewed from above, but which appear white when viewed horizontally from the tip of the wing. Fringe of wing, longest on posterior border, grey, appearing dark in some lights and nearly white in others. Wing with a purplish iridescence.

*Genitalia*: In the male very similar to those of *bengalensis*, but the inferior appendages decidedly shorter. In the female it consists of a very concave (on the upper side), leaf-shaped appendage, bending backwards, but the appendage probably consists of two symmetrical blade-like halves, as in the other species.

*Described* from four ♂♂ and twelve ♀♀ in the Indian Museum collection from the following localities: Kasauli (Simla district), 6,300 feet, 15-v-08; Simla, 7,000 feet, 10-v-08; Kurseong (Darjiling district), 5,000 feet, 4-vii-08. Types in the Indian Museum. At Kasauli Dr. Annandale found the species common in bungalows on the date given. He has also taken it on mossy walls and at light in Calcutta.

*N.B.*—In a specimen from Calcutta (3-vi-08) there is a slight but distinct spot of black hairs at the tip of each of the veins, and the tarsi are more densely covered with white scales. It may possibly be distinct, but I can detect no other differences of value.

***Psychoda vittata*, mihi, sp. nov.**

♀. Calcutta. Long. 1 mm.

*Body* pale yellow with grey and white hair.

White bristly hair between the eyes, with black bristly hair below. Scape of antennae with the joints barely broader at the tip; second rather short, both with black bristles. Flagellum of ten dirty yellow, distinct, long-necked, flask-shaped joints, each surrounded by a thick verticel of stiff blackish grey hairs, also a terminal conical joint which is composed of three small coalescing subspherical ones. The antennae have the thickened appearance noticeable in *nigripennis*.

*Legs* pale yellow, with a few irregular black bristles; hind femora with a row of long bristles and hind tibiae with two rows of long bristly hair. Tibiae with a few black spines at the tip.

*Wings* pale grey: the veins bearing the usual blackish grey hairs, with a wide transverse band (composed of erect light brown hairs) across the centre of the wing, and the apical portion of the wing is also broadly covered with similar brown hairs. At the base of the wing is a space covered with erect, soft, white hairs, and some traces of a similar patch towards the costa between the two areas of brown hairs. Fringe of wing on costa brownish grey, on posterior margin, more grey or whitish.

*Described* from five ♀ ♀, dated Calcutta, 11-vii to 2-viii-08, taken by Dr. Annandale; common on mossy walls.

*N.B.*—Further specimens in the Indian Museum collection may represent a small variety of this species with less conspicuously banded wings, and one or two of them show a darkening of the tips of some of the tarsal joints. The hair on the thorax is sometimes snow-white, sometimes yellowish grey, which inclines me to the opinion that they all represent the present species.

### ***Pericoma spinicornis*, mihi, sp. nov.**

♂. Himalayas (Simla and Darjiling districts). Long.  $1\frac{1}{4}$  to  $1\frac{3}{4}$  mm.

Very near *appendiculata* (*v. post.*) in general appearance, but very distinctly differing in the *first joint of the flagellum*, which is  $3\frac{1}{2}$  times as long as the second, sub-cylindrical, slightly narrowed and rounded at base, and slightly contracted just before the tip. This joint bears on its upper surface a row of *five or six long, strong, black, vertical straight spines*, set in raised sockets, followed by, placed almost at the apex of the joint, two (perhaps three) other still longer spines springing from a common socket. The under side of this joint is beset with narrow, curved, greyish scales. The remainder of the flagellum consists of thirteen sub-equal, elongated joints, gradually shortening to the last one, which is styliform. The two basal joints are thickly beset with very elongate, whitish grey scales, with which are intermixed some long, stiff, black bristles. On the face and anterior part of the thorax the bristles become almost scale-like, and are nearly white.

*Legs*: Femora slightly curved, sometimes considerably so, sometimes nearly straight. The femora and tibiæ are covered with long, pale yellowish grey, bristly hair; the tibiæ tips having a circlet of rather elongate, whitish, scaly bristles, with some short black bristles intermixed; the tarsi are covered with black scales and bristly black hair. The base of the metatarsus, and of the following joint, and the tip of the last joint are covered with small, cream-white scales.

*Wings*: Venation and general appearance as in *appendiculata*; the veins with the double row of hairs each, as are present in most species. The wing border has a fringe of grey hairs, which appear lighter or darker according to the direction in which the light falls on them; whitish towards the tip of the wing, and both blackest and longest on the basal portions of both anterior and



posterior borders. On the surface of the wing are short rows of quite white, short, bristly hairs, placed at apparently irregular intervals along the veins, these hairs being intermixed with black ones towards the base of the wing. The hairs on the surface of the wing on its apical half, and towards the centre portions of both anterior and posterior margins are much darker than on the remaining surface, thus leaving the base, and the proximal part of the centre of the wing apparently much clearer, as in *appendiculata*.

*Genitalia*: Superior appendages consisting of a short, elliptical, basal joint, and a thin, curled, cylindrical, pointed distal one, the whole appendage being small and easily overlooked; the basal joint bearing stout bristles with sockets, the distal joint bare. Inferior appendages arising from a triangular basal plate, sickle-shaped, bearing a number (about twenty) of flattened spatulate spinules on the distal two-thirds of the dorsal surface.

*Described* from eight ♂♂ in good condition in the Indian Museum taken by Dr. Annandale at Kurseong (5,000 feet), 5-vii-08, and some others in less good condition from the same source; also two ♂♂ from Simla (7,000 feet), 11-v-08. I took three males at Darjiling on windows, 2-x-08.

***Pericoma appendiculata*, mihi, sp. nov.**

♀. North Bengal. Long.  $1\frac{3}{4}$  to 2 mm.

*Body* blackish, rather sparsely covered above and below with whitish grey hair, which is thickest towards the posterior borders of the abdominal segments, and is darker in some specimens. The posterior part of the thoracic dorsum bears long, black, bristly hair.

*Head*: Eyes black, facets very large, bronze; palpi long, brownish grey, with a few hairs. Antennæ sixteen-jointed, scape thick, first joint cylindrical, second globular; a narrower flagellum of fourteen ovate joints, each with a rather thin verticel of hairs, *first joint only barely longer than second: without spines*.

*Legs* pale yellowish white, *fore and hind femora distinctly curved*, tarsi mainly black. The legs with numerous bristles of unequal length, some long bristly hairs on the tibiæ, which have a circlet of scale-bristles at the tip; some close-lying small scales on the femora.

*Wings* dark grey. The lower prong of the fourth longitudinal vein springs at right angles from the upper, and then forms a second right angle, *bearing a distinct appendiculation* at that spot, directed backwards. The fourth longitudinal vein forks a little behind the fork of the second, which itself is placed just before the centre line of the wing. The veins, which are very distinct, all bear the usual double row of partly erected hairs, directed forwards and backwards, and at the tip of each vein is a small bunch of stronger bristly hair; the intervening space (especially on the hind borders) being nearly clear, thus giving the border of the wing the appearance of bearing alternate black and white spots. The hairs

are in the main black, but those on the proximal half of the disc (except those in the immediate vicinity of the third vein) are distinctly more erect than the others, and are distinctly *grey*. A thick row of bushy, long, black bristly hair on nearly the whole length of the seventh vein. Wing-border with fringe of black hair which is rather short on the apical half, longer on the basal half of the costa, and longest and thickest on the basal half of posterior border. Towards the ends of some of the veins are a few silvery white, irregularly placed, elongated scales.

The *genital apparatus* consists of a single, horny, pointed, bare appendage of moderate size, projecting rather prominently.

*Described* from ten ♀ ♀ in the Indian Museum collection from Kurseong, taken by Dr. Annandale, 5-vii-08. A ♀ from Siliguri, North Bengal, 18—20-vii-07, is in the same collection.

*N.B.*—I suspect that this species is the ♀ of *spinicornis* on account of all the specimens of that species being ♂ ♂, and all those of *appendiculata* ♀ ♀; taken into consideration with the fact that they were nearly all captured at the same time, and in the same locality. I also found both sexes at Darjiling from September 20th this year up to October 2nd, the females being rather common on windows and attached to the under side of large leaves on the hillside, in both situations in company with an abundance of *Psychoda bengalensis*. As I know of no other species in the family varying sexually to such a striking extent as occurs between the present two forms in the first joint of the flagellum, I refrain from uniting both forms under one name: should they represent one species only, the name *spinicornis* must stand.

***Pericoma annandalei*, mihi, sp. nov.**

♀. Darjiling district. Long. 2 mm.

*Head*: Frons with long greyish white bristly hairs, and a few black bristles about the mouth. Eyes black, facets large, those on upper border of eyes bronze. Antennal scape thickly clothed with long white scales, and on upper side with some blackish brown ones; flagellum of thirteen elongated, cigar-shaped, light brown joints, clothed rather thickly with long greyish white, bristly hairs. Palpi well developed, long, black, thickly clothed with black scaly bristles and hairs. Back of head black, bare.

*Thorax* moderately shining black, with long black hair which in certain lights has a blackish grey tint. Humeral calli bare, distinct, shining black.

*Abdomen* black, with black bristly hairs. Ovipositor brown, of moderate size and normal shape.

*Legs* brown, with black and grey hairs, and both black and white bristles, the latter less numerous than the black ones. The tips of the tibiæ have a few white scales, the metatarsi are nearly wholly clothed thickly with white scales, and there are also a few at the extreme tips of the tarsi.

*Wings* brownish grey, rather thickly covered with black hairs, and with a fringe of long black hairs around the whole border except at the tip of the wing, where, for the distance between the lower branch of the second longitudinal vein and the upper branch of the fourth, the black hairs are replaced by long, snow-white bristly hairs. Five spots on the wing-border (each consisting of a few silvery white scales, which have a faint bluish tint) are placed as follows: a larger one in the centre of the fore border, the second (a small one) just beyond the first; the third at the end of the lower branch of the fourth longitudinal vein; and the fourth and fifth at the tips of the sixth and seventh longitudinal veins, the fourth spot being the largest.

*Described* from a perfect unique ♀ in the Indian Museum collection captured by Dr. Annandale at Kurseong, 5-vii-08.

***Pericoma margininotata*, mihi, sp. nov.**

♂ ♀. Western Himalayas (Simla district). Long.  $1\frac{1}{4}$ – $1\frac{3}{4}$  mm.

*Body*: Ground colour of thorax blackish brown, of abdomen, blackish, both covered with thick, long, pale yellowish grey bristly hair, plentifully intermixed on the thorax with black hairs, and likewise, to a less degree, on the base of the abdomen. The hairs on the thoracic dorsum show a tendency to be arranged in fan-shaped sets. On the abdomen they are arranged in a thick row of long ones on the posterior border of every segment, with a shorter, erect row in front of them. Pleuræ light to dark mahogany brown, bare, or nearly so. Eyes bronze, with large facets. The antennæ have the two large basal joints (second one cylindrical, wider than the first, which is cup-shaped) covered with short white scales, and are surrounded by a cluster of longer ones; flagellum of thirteen small globular joints of equal size, last one conical, each with a circlet of a few long black hairs, and more numerous, short white ones.

*Legs*: Femora and tibiæ grey, with minute greyish white pubescence, a number of longer, white bristly hairs (with black reflections in certain lights). These are apparently irregularly placed on the fore legs and the femora, but show a tendency to form longitudinal rows. Those, at least on the hind tibiæ are arranged in three such longitudinal rows, one pointing outwards, the other two rows, posteriorly. The apical part of the tibiæ is narrowly but thickly clothed with jet-black scaly bristles, and the extreme tip with a circlet of white scaly bristles. The tarsi are thickly covered with jet-black scaly bristles, the tips of the metatarsus and following joint bearing a circlet of white scaly bristles. The metatarsus bears several very strong long black bristles, and the extreme tarsi tips have minute cream-coloured scales.

*Wings*: Dark grey, with all the veins bearing a double row of spreading hairs, and without scales. Upper fork of second longitudinal vein bifurcates at two-fifths of the wing, and the

fourth longitudinal bifurcates between one-fourth and one-third of the wing. A small spot, consisting of numerous rather strong black hairs, at the tip of each vein, and a similar spot at the bifurcations of the upper prong of the second longitudinal vein, and of the fourth vein, these two spots being in a straight line with the last spot on the posterior margin. The first spot on the anterior border, the last one on the posterior border, and the upper discal spot, are all larger and darker than the others, but this may be accidental.

The hairs in some parts of the disc of the wing are distinctly darker and show a tendency to form black patches, and along most of the veins are short rows and bunches, here and there, of quite white, erect, short, bristly hairs, becoming almost scale-like in the small tuft-like spots of them on the margin of the wing, placed alternately with the black marginal hair-spots. These give the border of the wing a strikingly distinct, tessellated appearance composed of black and white spots alternately. Wing-border with a fringe of blackish grey hair, which is shortest on the distal portion, especially on the apical part of the costa. Halteres rather large, cup-shaped, with hairy upper edge, the stem being very narrow and short.

*Genitalia* in ♂ : Superior appendages consisting of a short, stout, cylindrical basal joint, and a distal one which is shaped like a scorpion's sting, consisting of a basal bulb, and a slightly coiled, tube-like prolongation of about the same length. Inferior appendages arising from a broad, rather short basal plate, than which they are considerably larger; themselves sickle-shaped, each bearing at the distal end, on the dorsal surface, a pair of flattened, spatulate spinules, the whole joint covered with fine hairs.

*Described* from a male and two females in the Indian Museum collection, taken by Dr. Annandale during May 1907 and 1908 at Simla (7,000 feet).

#### Var. *lacteitarsis*, mihi.

Three ♀ specimens in the Indian Museum taken by Dr. Annandale at Kurseong, 4-vii-08, agree perfectly with the above description, but differ by the pubescence of the thorax and abdomen being much darker (nearly black), and by all the tarsi being wholly milk-white. This variety approaches *gilvipes*, but the black hair-spots at the tips of the veins in the wings are as distinct as in the typical *margininotata*, whereas in *gilvipes* they are much less distinct, and in this latter form the metatarsi are black, whilst in *lacteitarsis* they are white.

#### Var. *gilvipes*, mihi.

♀. Considerably resembling typical *margininotata*, but is smaller, and the general colour of the long hair of the thorax and abdomen is more brownish grey. The basal joints of the antennæ are invisible, owing to the position of the head in the

type specimen; the thirteen joints of the flagellum resemble those of *Psychoda bengalensis*. The legs have the tarsi (except the metatarsus, which is black nearly to the tip) entirely covered with cream-coloured microscopic, scaly pubescence. The wings resemble *margininotata*, and there appears to be a tendency to dark spots of a similar nature, placed irregularly on the disc of the wing, but especially on the bifurcations of the veins.

The genital appendages as in *margininotata*, but rather longer.

Described from three ♀ ♀ in the Indian Museum, from Calcutta, dated 28-vii-08 (type), 2-viii-08, and 17—18-viii-07.

N.B.—I place *lacteitarsis* and *gilvipes* as varieties of my *marginipunctata*, as the markings of the wing seem to keep them all within the range of one species and the variation in colour is not more than is known to occur in other species. The technical differences, therefore, rest with those of the tarsi, which may be regarded as black with white tips in the typical form; wholly white in *lacteitarsis*; and white with black metatarsi in *gilvipes*. It is possible that my two varieties represent one species, distinct from *marginipunctata*, in which case the name *lacteitarsis* had better stand.

### *Pericoma bella*, mihi, sp. nov.

♀. Darjiling.

*Body* covered with dense, greyish white bristly hair; very dense between the eyes and on lower part of face; arranged on the abdomen in transverse rows at the base of each segment. They are long and semi-erect, thus covering most of the abdominal surface. Antennæ with both joints of the scape covered with dense white scales, both joints appearing dark at their bases; flagellum of fourteen subconical joints, the apical one produced to a blunt conical point, each joint bearing a verticil of hairs, the whole flagellum having a grey appearance. Palpi apparently black, with white bristly hair. Genital appendage inconspicuous.

*Legs*: Femora with long bristly grey hair; hind pair thickly covered with whitish scales. Tibiæ blackish brown with long, irregularly placed bristles; a ring of close, short black bristles towards the tip, and a circlet of closely packed, elongated white scales at the tip. Metatarsus and tarsal joints black, with a circlet of short white scales at the tip of most of them.

*Wings*: Fork of the upper branch of second longitudinal vein and the fork of the fourth vein both occur a little before the middle of the wing. The upper branch of the second vein, immediately after its origin, takes a rather sudden curve upwards, descending slightly to where it forks, and the lower branch ends only slightly above the extreme tip of the wing. The third vein originates in a right angle from the fourth, just beyond where the second vein divides into its upper and lower branches. The veins bear the usual double row of greyish, semi-erect hairs, and patches of black, erect, bristly hairs are distributed as follows: at the fork of

the upper branch of the second vein, and at (or just beyond) the similar fork of the fourth vein. Also about the middle of the sixth and along the seventh, except in its centre. The fringe round the border of the wing is generally greyish white, with an arc of black bristly hairs near the middle of the costa, and just beyond the middle; on the posterior border between the lower fork of fourth vein, and the fifth; also from the end of the sixth, nearly to the base of the wing.

*Described* from six females taken by me on windows at Darjiling during the last few days of September, and on October 1st, 1908. It was not uncommon.

*N.B.*—The patches of black hairs on the wing are by no means of regular size or shape, but the markings of the six examples examined agree fairly well with the distribution of black hairs as herein described. Small irregular patches occur in nearly all the specimens. Sometimes the general appearance of the wing is wholly blackish or black, with a slightly curved band of lighter hairs across it near the tip; a patch of white hairs in the middle of the costa, and beyond the middle on the hind border, and also at the tip of the wing.

The species is closely allied to (but, I have no doubt, distinct from) *margininotata*.

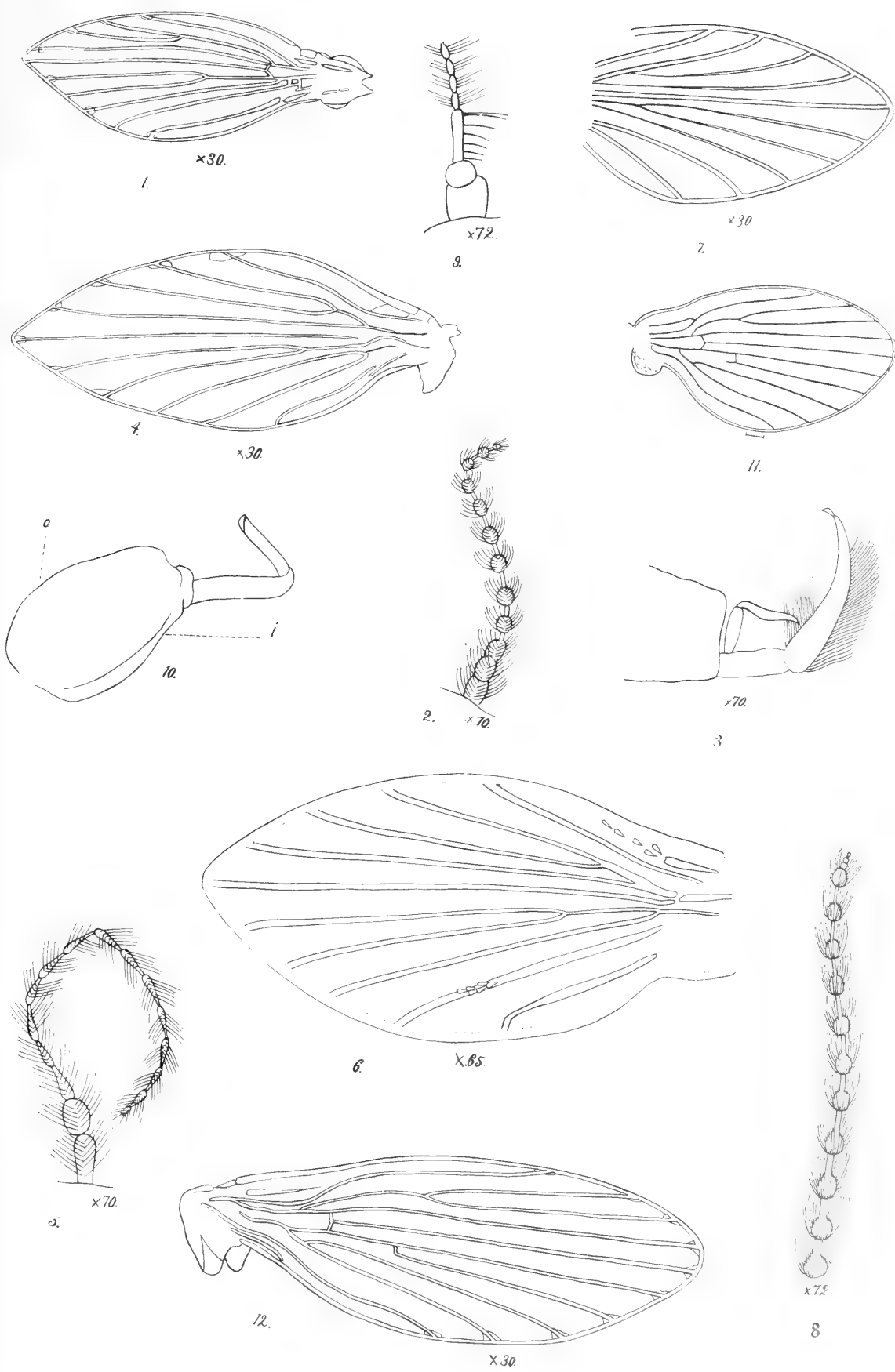
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EXPLANATION OF PLATE XXIV.

- FIG. 1. *Psychoda bengalensis*, Brun., wing.  
,, 2. *Id.*, antenna.  
,, 3. *Id.*, ♂ genitalia.  
,, 4. *Psychoda distincta*, Brun., wing.  
,, 5. *Id.*, antenna.  
,, 6. *Psychoda argenteopunctata*, Brun., wing.  
,, 7. *Psychoda albonotata*, Brun., wing.  
,, 8. *Psychoda nigripennis*, Brun., antenna.  
,, 9. *Pericoma spinicornis*, Brun., antenna.  
,, 10. *Id.*, ♂, superior appendage,  
right side, from above.  
,, 11. *Pericoma appendiculata*, Brun., wing.  
,, 12. *Pericoma margininotata*, Brun., wing.







# XXXIV. DESCRIPTION OF A NEW SPECIES OF MOUSE FROM THE MADURA DISTRICT, MADRAS.

By T. BENTHAM, *Indian Museum.*

This mouse is common round Rámanád town and digs shallow burrows there, in which it brings forth its young.

Seven specimens in alcohol and two skins are in the Museum. They were collected in August, 1905, by Dr. Annandale, and were found in company with *Mus* (*Leggada*) *buduga*.



FIG. 1.—Head of *Mus* (*Leggada*) *ramnadensis*.

*Description.*—Altogether a larger mouse than *M. buduga*. Fur longer than in this species, and inclined, in older animals, to be slightly spiny in the dorsal region. Tail shorter than head and body. Ear of medium length, rounded and, when turned forward, reaching the posterior extremity of the eye. Feet as in *M. buduga*, but longer and narrower. Skull very long for the size of the body. The nasal bones especially are very long, and give the animal in the flesh rather a shrew-like appearance. Molars as in *M. buduga* (see C, text-fig. 2).

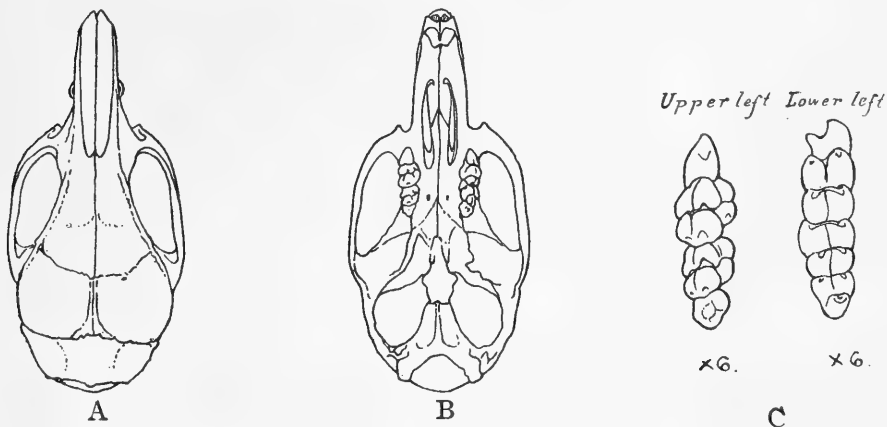


FIG. 2.—*Mus* (*Leggada*) *ramnadensis*: A = skull from above; B = skull from below;  $\times 2$ : C = Molars.

*Colour.*—In all eight specimens this is constant, being a light, almost golden fawn on the upper parts, lighter towards the side of the head. Hair on upper parts ash-grey for basal two-thirds, a sub-terminal ring of light golden fawn, the extreme tips dark brown. Ears dark silver grey both inside and out. Under parts and upper lip dead white, each hair being of the same white throughout.

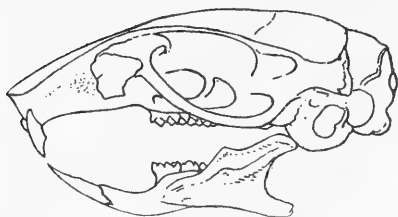


FIG. 3.—Side view of skull of *M. ramnadensis*.

Tail clay-colour above, lighter below, and faintly ringed throughout its length.

*Dimensions.*—The following are measurements of two small females in the flesh taken by Dr. Annandale:—

Head and body	..	..	66 mm.	55 mm.
Tail	..	..	61 „	50 „
Ear	..	..	10 „	8 „
Hind foot	..	..	13 „	10 „

Measurements of dry skin of full-grown male:—

Head and body	..	..	..	77 mm.
Tail	..	..	..	55 „
Ear	..	..	..	10 „
Hind foot	..	..	..	16 „

Measurements of two male skulls:—

Total length	..	..	25 mm.	25 mm.
Breadth, zygoma to zygoma	12	„	11 „	
Length nasals	..	..	11 „	11 „

Some of the specimens were sent to the British Museum, where Mr. Wroughton stated that they might prove to be identical with Blyth's *Mus albidiventris* (cf. *Mem. Asiat. Soc. Bengal*, vol. i, p. 22). Blyth, however, afterwards admitted that this mouse was identical with *Mus cervicolor*.

In any case there seems to be no specimen of “*albidiventris*” in existence, and, as Blyth's description of this animal appears to be too short to be definitive, it would be better to drop the species altogether. The mouse under discussion is certainly not *Mus cervicolor*, as can be judged from the above description. I propose, therefore, to make a new species and call it *Mus (Leggada) ramnadensis*, sp. nov., in virtue of the locality whence it was obtained.

# XXXV. SOME CLERIDÆ OF THE INDIAN MUSEUM.

By S. SCHENKLING, *Berlin*.

A lot of *Cleridæ* kindly sent to me for identification by Dr. N. Annandale contains the following species; among them are two new species of the Oriental genus *Callimerus* of which I give here a short description.

1. *Cladiscus sanguinicollis*, Spin.—Andamans.
2. „ „ sp. (immature).—Andamans.
3. *Tillus notatus*, Kl., var. *tristis*, Schklg.—(?) Calcutta.
4. *Callimerus cribratus*, sp. nov.

Niger, capite densissime, pronoto minus dense punctato, palpis apice, antennis basi flavis, elytris irregulariter crebre punctatis, apicibus rotundatim emarginatis, pone medium fascia albo-squamosa. Long. 6 mm. Bengal: Berhampur, Murshidabad District (R. E. Lloyd).

Head very finely rugose. Thorax bluish black, coarsely but not very thickly punctured, at the sides confusedly rugose, largest width before the middle. Scutellum densely clothed with long white hairs. Elytra black, bronzy shining, sparsely not densely punctured, behind the middle a fascia nearly straight of white hairs, abbreviated towards the suture, the extreme apex deeply emarginated between a short interior and a longer exterior tooth. Hind tibiæ not denticulate, lamellæ of the tarsi yellowish.

5. *Callimerus pulcher*, sp. nov.

Niger, violaceo micans, prothoracis punctis duobus, scutello, elytrorum fascia postmediana maculisque duobus (prima rotunda pone basim altera longa ante apicem) albo-squamosis, femoribus rufis. Capite densissime rugosulo, prothorace globoso, parce fortiter punctato, elytris lateribus dense, partim fere seriatim punctatis, juxta suturam fere glabris, apice non emarginatis. Long. 7 mm. Upper Burma: N. Shan Hills (F. Coggin Brown).

Head and thorax black, bluish shining, the antennæ at the base yellow. Thorax highly globular, sparsely strongly punctured, with a white spot at the anterior margin on both sides. Elytra bluish and greenish shining, at the base and at the sides thickly and coarsely punctured (punctures partly arranged in rows, near the suture and before the apex much finer and smaller), behind a little divergent, single apex tapering, the elytra with the following white pattern: a narrow arcuate fascia abbreviated towards margins and suture, a round punctiform patch at the anterior fifth and a sutural line before the apex. All the sides of pectus and

abdomen clothed with white scales. Femora of light red, hind tibiæ not denticulate.

6. *Callimerus*, sp.—Kurseong, E. Himalayas, 5,000 feet.
7. *Opilo sordidus*, Westw., var.—Murree, W. Himalayas; Darjiling; Tukvar.
8. „ sp. nov.—Daffla Hills, N. Assam.
9. [*Natalis spinicornis*, Blackb.—Adelaide, Australia.]
10. *Tillicera javana*, Spin.—Kurseong, Sikkim; Shillong, Khasi Hills.
11. „ *bibalteata*, Gorh.—Sikkim.
12. *Orthrius subsimilis*, Wk.—Calcutta; Maldah.
13. „ *andamanensis*, Schklg.—Andamans.
14. „ *rufotestaceus*, Schklg.—Shillong, Khasi Hills; and Jhelum Valley, N.-W. Himalayas.
15. „ *tarsalis*, Gorh.—At light on board steamer, Damukdia Ghat, E. Bengal.
16. „ sp. nov.—Kurseong; a single specimen.
17. „ sp. nov.—Sukna, E. Himalayas, 500 feet; a single specimen.
18. [*Phlogistus imperialis*, Gorh.—Adelaide, Australia.]
19. [*Trogodendron fasciculatum*, Schreib.—Adelaide, Australia.]
20. [*Femithicola funestus*, Chevr.—Adelaide, Australia.]
21. *Trichodes spectabilis*, Kr., var. *kuwerti*, Rttr.—Kogyar, E. Turkestan.
22. *Dasyceroclerus* sp.—Calcutta; Lower Bengal: Port Canning.
23. *Phæocyctotomus* sp.—Andamans.
24. *Omadius seticornis*, Westw.—Malay Archipelago.
25. „ *mediofasciatus*, Westw.—Sikkim; Sibsauror, Assam.
26. „ *roepstorfi*, Kuw.—Andamans.
27. *Neohydnius despectus*, Gorh.?—Lower Burma: Base of Dawna Hills, interior of Amherst District.
28. „ sp. nov.—Calcutta; a single specimen.
29. *Tenerus signaticollis*, Cast.—Nicobars.
30. „ „ var. *marginipennis*, Gestro.—Sibsauror, Assam.
31. „ *flavicollis*, Gorh.—Sibsauror, Assam.
32. „ *cyanopterus*, Spin., var.—Andamans.
33. „ *andamanensis*, Gorh.—Andamans.
34. [*Phymatophæa pustulifera*, Westw.—N. Zealand.]
35. *Necrobia ruficollis*, F.—Poona, W. India.
36. „ *rufipes*, De Geer.—On board ship, Madras coast; on skeleton of an elephant, Calcutta.
37. *Opetiopalpus obesus*, Westw.—Nilgiri Hills, S. India.

# XXXVI. THE FAUNA OF BRACKISH PONDS AT PORT CANNING, LOWER BENGAL.

## PART XII.—DESCRIPTION OF A NEW SPECIES OF POLYCHÆTE WORM OF THE GENUS *Spio*.

By A. WILLEY, D.Sc., F.R.S., Director, Colombo Museum.

*Spio bengalensis*, sp. nov.

Amongst the invertebrate animals collected in 1907 by Dr. Nelson Annandale from brackish ponds at Port Canning in Lower Bengal, there were some small tubicolous Polychæte worms which he sent to me for description. Although clearly belonging to the family Spionidæ, there appeared, under ordinary inspection, to be no trace of the long occipital (peristomial) tentacles which are characteristic of this family, nor were they seen in the living worms. But after repeated examination under strong reflected sunlight I have found what I take to be the bases or scars of the lost tentacles. In its general characters the species otherwise resembles the *Spio filicornis* described and figured by Malmgren (*Annulata Polychæta*, 1867, p. 92, pl. i, fig. 1) except that the branchiæ or branchial cirri, instead of occurring on all setigerous segments, are confined to the anterior region of the body, this being the distinctive character of the species.

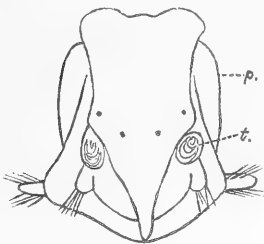


FIG. 1.



FIG. 2.

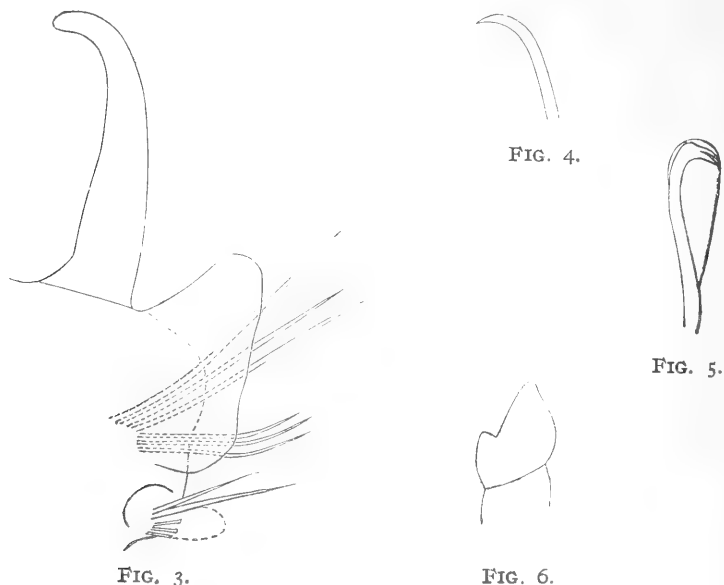
FIG. 1.—Head of *Spio bengalensis*: *p.* = proboscis; *t.* = tentacular basis.  
,, 2.—Anterior end of *Spio bengalensis* in side view.

The material includes at least two mature females; the ovaries commence in the posterior branchial region and may be followed segmentally on each side of the gut to the hinder region of the body. The size is small, 12 to 13 millimetres in length, with about 70 segments.

The four small eyes are placed as shown in fig. 1 when the proboscis is protruded, but the ocular area becomes narrower when the proboscis is withdrawn. The prostomium is slightly emarginate in front; behind the eyes it narrows down to a pointed

extremity ending on the first setigerous segment. At the sides of the head close behind the ocular area occurs a pair of structures which I identify as the scars of the occipital tentacles; these are followed by the small setigerous notopodia of the first setigerous segment (figs. 1 and 2). The branchiæ commence on the second setigerous segment and occur on twelve to fourteen segments only, the last two or three smaller than the preceding; they are distinct to their bases, not joined to the notopodial lamellæ (fig. 3). Behind the branchial region the parapodial prominences become very inconspicuous.

In the anterior segments capillary setæ occur in both fascicles, and the dorsal setæ remain capillary throughout, becoming very slender towards the posterior region of the body. Simple hooked setæ (setæ infimæ ventrales) appear singly in each neuropodium from about the 12th somite (fig. 4); they appear to be rather



- FIG. 3.—Fourth gill-bearing parapodium from hinder aspect. The neuropodial ligule was concealed in the preparation; compare fig. 2.  
 „ 4.—Ventral hooked seta from 12th foot.  
 „ 5.—Guarded uncinata seta or crochet from the 28th foot; sketched from a preparation *in toto*.  
 „ 6.—Pygidium in side view.

less curved in the hinder region. Guarded crochets (fig. 5) were observed from about the 28th segment; apart from the single inferior ventral seta mentioned above, they are the only setæ present in the neuropodia of the posterior segments, 6 or 7 appearing in each appendage.

The pygidium (fig. 6), as observed in one specimen, is simple with a ventral cone and a pair of low dorsal elevations.

The first small notopodium is hard to see in side view and is indicated by a dotted line in fig. 2



XXXVII. DESCRIPTION OF A NEW SPECIES OF SAW-FISH CAPTURED OFF THE BURMA COAST BY THE GOVERNMENT OF BENGAL'S STEAM TRAWLER "GOLDEN CROWN."

By B. L. CHAUDHURI, B.A., D.Sc.

*Pristis annandalei*, sp. nov.

Length of the rostrum in the total length 4·8, height of body 10·84, greatest breadth 6 in the total length. Breadth of rostrum at tip in the breadth of rostrum at base 1·75. The rostrum is armed with about 25 pairs of teeth, the left side having one more tooth than the right. The two anterior pairs and the two posterior ones are opposite to one another, the rest of the pairs do not lie opposite. Interspaces between teeth vary greatly, the diameter of the sockets of the teeth being contained in the interspaces differently, from 4 to 1 : teeth are mostly unequal and uneven. Mouth transverse, with a membranous valve or fold hanging from the upper edge of the upper jaw behind the teeth,



*Pristis annandalei*, sp. nov.

with two round lobes at two ends. Spiracles large and oblique, posterior to the eyes, the diameter of the eye being contained 4·6 times in the distance between the eye and the spiracle which is 2·1 diameters of the eye in length. Fins : first dorsal is neither entirely behind the ventral nor opposite to it, but commences slightly posterior to the anterior side of the ventral fin ; second dorsal smaller than the first, not reaching the caudal ; the distance between the second dorsal and the caudal contained 2·75 times in the distance between the two dorsals. The caudal has a distinct lower lobe, which is decidedly round. The keel is very imperfectly developed on the posterior part of the tail. Pectorals triangular, the distal angle almost a right angle.


*Colour*.—Head and upper part of the body ash-grey, gradually passing into light blue and then to light yellow on the sides, edged with a reddish line from snout to pectoral fins; eyes gold; body of the dorsal and caudal fins yellowish to light red; the claspers red.

One ♂ caught near Elephant Point, Burma Coast, in July 1908, measuring 8 feet 7 inches without the rostrum.

It differs from *Pristis zysron*, which it resembles in some respects, in the following points :—

- (1) It possesses an unequal number of teeth on the two sides of the saw, whereas *P. zysron* has the same number on each side;
- (2) the first dorsal in *P. zysron* is almost entirely behind the ventral, whereas in the new species it is almost above the ventral;
- (3) in *P. zysron* the second dorsal is larger than the first, in the new species it is smaller;
- (4) in *P. zysron* the second dorsal is situated near the root of the caudal, to which its posterior lobe almost reaches, but in the new species there is a considerable space between;
- (5) in *P. zysron* the caudal is without a lower lobe, but in the new species it has a distinct lower lobe, which is rounded;
- (6) the pectorals in *P. zysron* are rounded distally, whereas in the new species they are triangular.

I have compared the type of the new species with specimens of all the known Oriental species.



# XXXVIII. A NEW STING RAY OF THE GENUS *TRYGON* FROM THE BAY OF BENGAL.

By N. ANNANDALE, D.Sc., *Superintendent, Indian Museum.*

Among the Selachians recently captured by the Bengal Government's trawler "Golden Crown" is a large specimen of a species of Sting Ray which does not appear to have been as yet described. It may be defined as follows :—

## *Trygon microps*, sp. nov.

*Size* large. *Colour* white ; the dorsal surface of the disk suffused with rose-pink, without definite markings ; tail grey above, becoming darker distally. *Disk* rhombic, wider than long by more than one quarter of the width ; the pectoral angles rather greater than right angles. *Snout* rounded as a whole, but with a small terminal projection. *Eyes* very small, dark in colour, little prominent ; spiracles large, without dorsal flaps, their area more than eight times that of the eyes ; distance from eyes to tip of snout more than twice as great as that from eye to eye. *Tail* without cutaneous fins, longer than disk, consisting of a broad, flat proximal part about half as long as the disk, and a slender, cylindrical distal part probably longer in unmutilated specimens, a single massive spine borne at the junction of the two parts ; a very low ridge on the ventral surface of the distal part. *Skin* soft and delicate, without enlarged tubercles on the disk, bearing numerous minute, spiny denticles, which become rather larger on the tip of the snout and the region surrounding the eyes and spiracles ; proximal part of the tail armed with much larger spiny denticles, which are largest on the sides and only bear very short spines on the ventral surface ; distal part densely clothed with denticles similar to but smaller than those on the sides of the proximal part. *Mouth* large ; upper jaw undulating slightly, lower jaw practically without undulation ; a serrated cutaneous flap hanging down from the roof of the mouth ; five short finger-like processes on the floor of the mouth, three in the centre and one at either side.

## *Measurements of the type specimen (♀).*

Length of disk	..	..	4 ft. 7 inches	(137 cm.)
Breadth of disk	..	..	6 „ 6 „	(195 „ )
Length of tail (? mutilated)	6 „	5 „		(192 „ )

*Habitat*.—Coast of Chittagong, head of the Bay of Bengal ; shallow water (17 fathoms). Captured at the end of August, 1908.

Only one specimen has as yet been taken. It represents a form very distinct from any hitherto fully described, but may be identical with Blyth's *Trygon atrocissimus*, a species described from pieces of a tail and therefore impossible to recognize, especially as the "type" appears to have perished. Although the specimen of *T. microps* was taken in shallow water, its pale colour, small eyes and delicate skin would suggest that it is really a deep-sea form.



TRYGON MICROPS, sp. nov. (Photograph of type specimen.)



## XXXIX. NEW MICRO-LEPIDOPTERA FROM INDIA AND BURMA.

By E. MEYRICK, B.A., F.R.S.

The following descriptions are from specimens taken by Dr. N. Annandale, and the types are in the collection of the Indian Museum.

### CERACIDÆ.

#### *Cerace*, Walk.

I have formerly treated this genus as belonging to the *Plutellidæ*, but I now recognise that its neuration is essentially Tortricid in character, and that the smooth head cannot outweigh this. I propose, therefore, to constitute the *Ceracidæ* as a distinct family, agreeing with typical *Tortricidæ* in neuration and other important points, but differing from them by the smooth head.

#### *Cerace mesoclasta*, sp. nov.

♀. 41 mm. Head white, collar purple-blackish edged with white. Palpi white, with a grey streak along upper edge of second joint except at apex, terminal joint grey. Antennæ dark grey ringed with white. Thorax dark purple-fuscous, with five white spots, patagia edged with white. Abdomen blackish, segmental margins light ochreous-yellow, apex orange. Fore wings elongate, narrow, rather dilated posteriorly, costa gently arched, apex very obtuse, termen rounded so as to project rather beyond apex; dark purple-fuscous, covered with rows of numerous small whitish spots between veins, towards costa united into transverse strigæ which become larger towards base; in the middle of disc these spots coalesce into a longitudinal streak; an elongate orange spot on termen, extending from vein 2 to 6; cilia dark fuscous (imperfect). Hind wings whitish; a fuscous blotch suffusedly spotted with dark fuscous occupying apical fourth of wing; a row of dark fuscous spots along costa; about three rows of dark fuscous spots extending over dorsal area of wing from base to apical blotch, smaller towards base; cilia white, round apical blotch mostly dark fuscous.

Kurseong, E. Himalayas, at 5,000 feet, in May; one specimen. Nearest *C. stipatana*, but easily known by the discal white streak, less extensive orange patch, spotted dorsal area of hind wings, and blackish-banded abdomen. In the specimen described veins 6 and 7 are short-stalked in one fore wing by an abnormality, the other wing being quite normal.

## GELECHIADÆ.

*Ochmastis*, gen. nov.

Head smooth-scaled; ocelli absent; tongue developed. Antennæ  $\frac{4}{5}$ , in  $\sigma$  simple, basal joint elongate, without pecten. Labial palpi long, recurved, second joint rather short, with moderate projecting tuft of rough hairs towards apex beneath, terminal joint nearly twice as long as second, slender, acute. Maxillary palpi very short, filiform, drooping. Posterior tibiæ clothed with long hairs above. Fore wings with vein 16 furcate, 2 from near  $\frac{4}{5}$ , 3 and 4 approximated from angle, 5 parallel, 6 absent, 7 and 8 stalked, 7 to apex, 11 from middle. Hind wings 1, elongate-trapezoidal, termen scarcely sinuate, cilia over 1; 2 widely remote, 3-5 rather approximated at base, 6 and 7 long-stalked.

Belongs to the group of *Ypsolophus*, in which it is characterised by the neurulation.

*Ochmastis chionacma*, sp. nov.

$\sigma$ . 16 mm. Head and thorax white sprinkled with dark fuscous. Palpi white, second joint blackish except towards apex, terminal joint sprinkled with grey; with three undefined blackish rings. Antennæ blackish ringed with white. Abdomen grey, anal tuft ochreous-yellowish. Fore wings elongate, narrow, costa gently arched, apex obtuse, termen very obliquely rounded; white, irregularly sprinkled with dark fuscous; two small dark fuscous spots near base above and below middle, upper marked with black; an irregular quadrate dark fuscous patch on dorsum before middle, reaching  $\frac{3}{4}$  across wing, enclosing an elongate pale yellow-ochreous blotch of somewhat raised scales dilated posteriorly and edged above with a few black scales; three subconfluent dark fuscous blotches forming an irregular streak from middle of disc to  $\frac{5}{8}$  of costa, crossed by an interrupted thick black streak in disc from before middle to  $\frac{3}{4}$ , and two or three short black streaks on veins beyond this; an elongate black mark on costa before middle; apical area forming a roundish clear white spot, edged by a marginal black line: cilia white, on costa with three black wedge-shaped spots, round apex with three dark fuscous bars towards tornus suffused with fuscous and sprinkled on basal half with dark fuscous. Hind wings grey, thinly scaled towards base; cilia pale grey towards base, ochreous-tinged.

Dawna Hills (2—3,000 feet), Lower Burma, in March; one specimen.

## ELACHISTIDÆ.

*Stathmopoda placida*, sp. nov.

$\eta$ . 10-11 mm. Crown whitish-ochreous irrorated with fuscous, face pearly white. Palpi whitish-ochreous, in front white.



Antennæ whitish-ochreous, tips dark grey above. Thorax whitish-ochreous irrorated with blackish, posterior extremity white. Abdomen grey, beneath white. Fore wings sub lanceolate, broadest near base, thence narrowed to acute apex; rather dark fuscous, with slight purplish tinge; two broad white fasciæ, first very broad dorsally, where it covers basal third of wing, much narrowed towards costa at beyond  $\frac{1}{4}$ , margins straight, enclosed basal area of costa ochreous-whitish irrorated with black; second fascia at  $\frac{2}{3}$ , rather narrowed towards costa, anterior edge straight, posterior convex, oblique: cilia fuscous. Hind wings and cilia grey.

Rangoon, in February; two specimens. I note here that the genus *Placostola*, Meyr., founded on a species allied to the above, cannot be maintained as distinct from *Stathmopoda*.

*Stathmopoda calyptæra*, sp. nov.

♀. 10 mm. Head shining white. Palpi white, terminal joint externally with a dark fuscous line. Antennæ whitish. Thorax white, on back with a curved dark fuscous transverse line near anterior margin. Abdomen yellowish-fuscous, beneath and at sides white. Fore wings very narrow, widest near base, thence narrowed to acute apex; dark fuscous; a white basal patch occupying  $\frac{2}{5}$  of wing, its outer edge inwardly oblique from costa; some undefined whitish suffusion about  $\frac{2}{3}$  and before apex: cilia fuscous. Hind wings and cilia fuscous.

Dawna Hills (2—3,000 feet), Lower Burma, in March; one specimen.

*Promalactis nebias*, sp. nov.

♀. 9 mm. Head glossy ochreous-whitish, sides of crown sprinkled with grey. Palpi whitish, second joint yellowish-tinged and transversely striated with dark fuscous, terminal joint with a longitudinal line of dark fuscous irroration on each side. Antennæ white ringed with blackish. Thorax light ochreous-yellowish, shoulders black. Abdomen grey. Fore wings lanceolate, apex acute; light ochreous-yellowish, tinged with deeper yellow in disc posteriorly; a fine white line edged with black irroration beneath from middle of base to  $\frac{1}{4}$  of dorsum; two fine white acutely angulated transverse lines at  $\frac{1}{4}$  and  $\frac{1}{2}$ , edged with black irroration, each preceded on costa by an oblique wedge-shaped fuscous blotch irrorated with black, second followed on costa by a larger triangular similar blotch extending to  $\frac{4}{5}$ ; from angle of first a fine white line edged with some black scales proceeds to tornus; an irregular streak of blackish irroration along termen from tornus to apex, marked with small white spots in middle and at apex: cilia pale yellowish, towards base with some blackish specks. Hind wings grey; cilia pale grey.

Dawna Hills (2—3,000 feet), Lower Burma, in March; one specimen.

## GRACILARIADÆ.

*Acrocercops cyclopa*, sp. nov.

♂ ♀. 6 mm. Head and thorax shining ochreous-white. Palpi slender, white. Abdomen whitish. Legs white spotted with grey. Fore wings very narrowly elongate-lanceolate, acute; white; a slender light fuscous streak along basal third of costa; three light fuscous oblique fasciæ, first in middle, slender; second at  $\frac{3}{4}$ , somewhat broader; third very slender, separated by a fine line from a conspicuous roundish deep black apical spot: cilia whitish-fuscous, round apex white with two light fuscous shades. Hind wings grey; cilia whitish-grey.

Calcutta, in August; two specimens. Nearest to *A. saurophis*, Meyr.

*Acrocercops thraustica*, sp. nov.

♀. 9 mm. Head loosely haired, white, crown ochreous-tinged. Palpi white, second joint grey towards base, with short rough apical tuft beneath. Antennæ grey. Thorax white, sides grey. Abdomen grey, beneath white with lateral series of oblique blackish stripes. Legs white, obliquely striped with blackish. Fore wings very narrowly elongate, short-pointed; light fuscous; costa whitish-suffused on median third; a blackish longitudinal streak in disc from  $\frac{1}{4}$  to beyond middle, edged above with fuscous-whitish; an elongate white dorsal patch from base to beyond  $\frac{1}{4}$  of wing, edged with blackish above, and containing a series of four blackish dots; a white sub-dorsal streak from beyond this to beyond middle, rather oblique upwards, edged with blackish above and beneath; beyond apex of this is a blackish patch composed of three confluent oblique streaks, beneath which is a white dorsal dash, and followed by a very oblique white streak extending to  $\frac{5}{6}$  of disc, where it meets a very oblique black streak from middle of costa, whitish-edged above; a white elongate mark above tornus; a fine curved whitish line from  $\frac{3}{4}$  of costa to termen above tornus; apical area beyond this ochreous-whitish finely and irregularly striated with black, with a black apical dot: cilia white, with basal and posterior black lines, and two black apical hooks, towards tornus greyish-tinged. Hind wings and cilia grey.

Calcutta, in July, at light; two specimens.

## PLUTELLIDÆ.

*Atteva sciodoxa*, sp. nov.

♂ ♀. 23-28 mm. Head whitish, collar orange edged with white. Palpi white, terminal joint dark grey mixed with white. Antennæ grey. Thorax ochreous-orange, with a white spot on patagia, and two behind middle of back. Abdomen ochreous-orange. Posterior legs in ♂ thin, weak, tibiæ clothed with long whitish hairs, tarsi twisted. Fore wings elongate, narrow at base,

considerably dilated posteriorly, costa towards apex gently arched, apex rounded-obtuse, termen little oblique, slightly rounded; ochreous-orange, slightly violet-tinged; about 18—24 white spots, *viz.*, three large transverse ones and two or three small on dorsum, three more or less large rounded ones and two or three small in disc, one rather large transverse on termen above tornus, and the rest small, rounded, scattered along costa and towards apex: cilia whitish, base ochreous-orange. Hind wings grey, thinly scaled and sub-hyaline towards base; cilia whitish, base grey.

One specimen at base of Dawna Hills, Lower Burma, in March; and I possess three others from the island of Penang, and Labuan, Borneo.

#### TINEIDÆ.

##### *Tischeria ptarmica*, sp. nov.

♂ ♀. 4-5 mm. Head, palpi, and antennæ light greyish-ochreous. Thorax greyish-ochreous sprinkled with fuscous. Abdomen grey, apex greyish-ochreous. Fore wings lanceolate; 6 present; light greyish-ochreous irrorated with fuscous, with some scattered dark fuscous scales, on dorsal half more or less yellowish-tinged; undefined dorsal spots of dark fuscous irroration at middle,  $\frac{3}{4}$ , and apex: cilia pale greyish. Hind wings and cilia pale greyish.

Bred in plenty from larvæ mining small elongate blotches in leaves of *Zizyphus jujuba*, at Puri, Orissa, in January. The species occurred in great profusion, leaves an inch in diameter containing twenty or more larvæ, and the moths are described as "swarming like a cloud of midges round the tree." The mine, larval habits, and pupa are similar to those of European species.

##### *Crypsithyris spelæa*, sp. nov.


♂ ♀. 9-10 mm. Wholly pale whitish-ochreous except eyes, which are deep black. Fore wings elongate, narrow, costa gently arched, apex pointed, termen extremely obliquely rounded. Hind wings with transverse vein present, 2—7 separate.

Khayon ("Farm") Cave, Moulmein, Burma, in March; three specimens. This is a very curious and interesting species, apparently a true cave-dweller, found permanently resident "in total darkness" (Annandale), being the only known species of *Lepidoptera* adapted to such conditions; but since the eyes are fully developed and the power of flight maintained, it would seem probable that the darkness is not quite absolute, but such that eyes accustomed to it can still perceive faintly. The absence of light has, however, sufficed to prevent the development of colour, the insects being practically bleached or colourless. The larvæ of four Indian species of *Crypsithyris* are known, and all are lichen-feeders, so that probably this may feed the same way, in portable cases on the rock-walls. Other Indian caves should be examined for similar species.

*Melasina apracta*, sp. nov.

♀. 15-18 mm. Head with appressed hairs, pale greyish-ochreous. Palpi moderate, rather curved, pointed, pale greyish-ochreous, second joint sometimes infuscated. Antennæ pale greyish-ochreous. Thorax pale greyish-ochreous suffused with fuscous anteriorly. Abdomen pale ochreous, more yellowish posteriorly, with large anal tuft of long hairs. Fore wings elongate, rather narrow, costa moderately arched, apex round-pointed, termen extremely obliquely rounded; pale greyish-ochreous, sometimes yellowish-tinged, suffusedly irrorated throughout with fuscous; a cloudy spot of darker fuscous suffusion in disc at  $\frac{2}{3}$ ; cilia ochreous-grey-whitish sprinkled with fuscous. Hind wings light greyish; cilia pale greyish-ochreous.

Mandalay, in March; two specimens.



## XI. NOTES ON SOME CHRYSOMELID BEETLES IN THE COLLECTION OF THE INDIAN MUSEUM.

By C. A. PAIVA, Assistant, Indian Museum.

The greater number of the specimens of this family in the collection are still unnamed, but those that have been identified have, with a few exceptions, been examined either by M. Baly or by the late Mr. Jacoby. The latter does not, however, appear to have made use of his notes on the collection in compiling the volume in the *Fauna of British India, Burma and Ceylon*, Coleoptera, ii, 1908, published shortly after his death, which has probably deprived coleopterists in India of a full account of the family.

As many of the new specimens are "types" and as all reference to several fully described Indian species has been omitted from the "Fauna," although they belong to the sections of the family dealt with, I have been asked by the Superintendent to prepare the following notes on some specimens in the Museum collection.

I have merely compiled the information to be obtained from Jacoby's, Baly's and Clavareau's labels, adding certain quotations and references to published literature.

### *Lema mandarensis*, Jac.

Jacoby, Fauna of British India, Coleoptera, Chrysomelidæ, vol. i, 1908, p. 69.

A "type" specimen of this species is in the collection of the Indian Museum, and it is the only named representative of the species in the collection. Jacoby when describing this species mentioned in the *Ann. Soc. Entom. Belgique*, xli, 1897, p. 421, that several specimens of this small species were obtained at Mandar in Bengal by Mr. P. Cardon.

### *Crioceris quadripustulata*, Fabr.

Jacoby, Fauna of British India, Coleoptera, Chrysomelidæ, vol. i, 1908, p. 78.

This species is worthy of note as Jacoby records it only from Tenasserim, Siam and Java, whereas there are specimens in the Indian Museum collection determined by him from Sikhim, Calcutta, and Sibsagar, Assam.

*Pseudolema suturalis*, Jac.

Jacoby, Fauna of British India, Coleoptera, Chrysomelidæ, vol. i, 1908, p. 83.

One specimen from Mandar, Bengal, named by Jacoby as *Clythra suturalis*, Jac., and labelled "Type." This specimen agrees with the description of the above species and has probably been forgotten by Jacoby.

*Pseudoclytra plagiata*, Duviv.

Jacoby, Fauna of British India, Coleoptera, Chrysomelidæ, vol. i, 1908, p. 102.

The type of this species was originally described by Duvivier from Konbir-Nowatoli. In the Museum collection there are specimens from Mandar, Bengal, which were returned named by Jacoby, having been compared with the "type" by Clavareau.

These two localities are not mentioned by Jacoby who only gives Southern India, Madras, as the distribution of the species.

*Gynandrophthalma crassipes* (Duviv.).

Jacoby, Fauna of British India, Coleoptera, Chrysomelidæ, vol. i, 1908, p. 112.

A "type" of Duvivier's species from Konbir, Eastern Bengal, is in the Indian Museum collection, but no mention of the fact is made either by Jacoby in his new book or by Duvivier in the *Ann. Soc. Entom. Belgique*, 1891, p. 31, where he describes this species.

*Ætheomorpha nigropicta* (Lefèv.).

Jacoby, Fauna of British India, Coleoptera, Chrysomelidæ, vol. i, 1908, p. 124.

One specimen from Calcutta in the Museum collection was doubtfully determined by Jacoby as a variety of the above species. There is no doubt that it is a varietal form, having the black lateral stripe on the elytra very much abbreviated and the anterior spot on the elytra entirely absent.

*Labidostomis humeralis*, Schneider.

C. O. Waterhouse, Trans. Linn. Soc. (Ser. 2.), Zool., vol. v, 1887, p. 131.

Five specimens, two males and three females from Badghis, Afghanistan, were named by C. O. Waterhouse. These specimens were collected by Dr. J. E. I. Aitchinson, attached to the Afghan Delimitation Commission, and are in the Museum collection. They agree very closely with Jacoby's description of *Labidostomis cummingi*, Jac. The only difference I can find is in respect to the size of the males, which (Waterhouse's specimens) are 9.5 mm. to 10 mm. in length, the females being 7 to 8 mm. in length.

*Labidostomis cummingi*, Jac., was obtained at Ormarah in Baluchistan by Cummings.

*Clytra succincta*, Lacord.

Jacoby, Fauna of British India, Coleoptera, Chrysomelidæ, vol. i, 1908, p. 152.

This species is recorded by Jacoby only from Bengal, China, and Java. It is, as he says, an abundant species and there are several specimens in the Museum collection from Bangalore (Mysore) and Karachi (Sind).

Evidently a very widely distributed species.

*Clytra lefèvrei*, Jac.

Jacoby, Fauna of British India, Coleoptera, Chrysomelidæ, vol. i, 1908, p. 154.

There are two specimens in the Museum collection from Mandar, Bengal, labelled "*Clytra occipitalis* Jac. type." This latter species has now been sunk by Jacoby as being a variety of *C. lefèvrei*, Jac. The above locality has not been mentioned in the "Fauna" by Jacoby.

*Clytra orientalis*, Lefèv.

Jacoby, Fauna of British India, Coleoptera, Chrysomelidæ, vol. i, 1908, p. 157.

A single specimen, from Bangalore, of this species is in the collection, and was returned named by the Paris Museum, among a number of other named members of this family. The ticket on the specimen is in Lefèvre's handwriting.

It is the only species mentioned in the new work by Jacoby as being represented in the "Calcutta Museum" collection.

*Clytra insularis*, Lefèv.

Jacoby, Fauna of British India, Coleoptera, Chrysomelidæ, vol. i, 1908, p. 155.

There is a specimen in the collection, from the Andamans, named by Baly as *Diapromorpha dejeani*, Lac. It clearly resembles specimens in the Museum collection which have been returned named by the Paris Museum, bearing a label in Lefèvre's handwriting, as *Clytra insularis*, Lefèv. These specimens are also from the Andamans.

The markings on the thorax and elytra are totally different in the two species, apart from their belonging to two different genera.

*Diapromorpha turca* (Fab.).

Jacoby, Fauna of British India, Coleoptera, Chrysomelidæ, vol. i, 1908, p. 169.

Although Jacoby states that this is rather a common and

widely distributed species in India, he gives no definite localities whence he had seen specimens. In the Museum collection there are a few specimens from Bangalore (Mysore) and Sahibgunge (Bengal). The specimen from the latter locality is totally different in appearance from the typical form. It was returned named by the Paris Museum and seems to belong to var. D. of the species.

There are five specimens identified by Baly as *Diapromorpha pallens*, Oliv. These do not resemble the specimens in the collection named *D. melanopus*, Lacord., of which species Jacoby makes *D. pallens*, Oliv., a synonym, but agree with a single specimen named by Jacoby as *Gynandrophthalma pallida*, Jac., which appears to be a *nomen nudum*.

*Cryptocephalus analis*, Oliv.

Jacoby, Fauna of British India, Coleoptera, Chrysomelidæ, vol. i, 1908, p. 247.

Recorded by Jacoby from Bengal, the Nilgiris, Coromandel and Tranquebar.

There is one specimen from Kulu named by Baly in the Museum collection.

*Cryptocephalus colon*, Suffr.

Jacoby, Fauna of British India, Coleoptera, Chrysomelidæ, vol. i, 1908, p. 247.

This species is evidently distributed through Assam and Burma to Siam. Jacoby records it from Assam and Siam and there is one specimen from Pegu (Burma) in the Museum collection.

*Pagria kanaraensis* (Jac.).

Jacoby, Fauna of British India, Coleoptera, Chrysomelidæ, vol. i, 1908, p. 360.

There are two specimens from Calcutta determined by Jacoby as belonging to this species. He has omitted this locality and records it only from Southern India : Belgaum ; S. Kanara.

*Scelodonta vittata* (Oliv.).

Jacoby, Fauna of British India, Coleoptera, Chrysomelidæ, vol. i, 1908, p. 382.

As Jacoby has given Pusa and Bombay as the only Indian localities whence this species has been recorded, and as the species is not uncommon, it would be as well to give the localities of the specimens representing it in the collection of the Indian Museum, some of which were named by Jacoby. Those from Murshidabad (Bengal) and Tavoy (Burma) were named by Jacoby. The others from Berhampore, Maldah (Bengal) and the Andamans were returned named by the Paris Museum.



*Scelodonta indica*, Duviv.

Jacoby, Fauna of British India, Coleoptera, Chrysomelidæ, vol. i, 1908, p. 383.

Recorded by Jacoby only from Konbir, E. Bengal. Undoubtedly a very common species in Calcutta, from which locality a rather large series of specimens were named for the Museum by Jacoby.

There are two specimens which were returned named by the Paris Museum. One is *Colasposoma cæruleatum*, Baly, and the other *Colasposoma ornatum*, Jac. Both are from Maldah (Bengal).

Five specimens from Bangalore were identified by Jacoby as *Colasposoma nitida*, Fabr., and four specimens from Ranchi (Bengal) were doubtfully identified by him as *Colasposoma affine*, Lefèv.<sup>1</sup> No mention of either of these species is made by him in the "Fauna."

*Abirus angustatus*, Lefèv.

Jacoby, Fauna of British India, Coleoptera, Chrysomelidæ, vol. i, 1908, p. 456.

Jacoby states he was unable to refer any Eastern form known to him to this species, as he knew no species of *Abirus* with a thorax nearly twice as long as broad. Among the specimens returned by the Paris Museum are two specimens named as belonging to this species, evidently a male and a female. The specimens bear a label in Lefèvre's handwriting. They are from Southern India. In neither of the specimens does the thorax appear to be twice as long as broad, as it is stated to be by Lefèvre in his description ("prothorace fere duplo longiore parum latiore").

*Abirus andamansis*, Lefèv.

Jacoby, Fauna of British India, Coleoptera, Chrysomelidæ vol. i, 1908, p. 457.

A "type" of this species is in the Indian Museum collection and was returned by the Paris Museum. It bears Lefèvre's label. Unfortunately the head and thorax are missing. There are no other examples of the species in the collection and it is apparently rare, as Jacoby did not see any specimens of it.

*Corynodes andamanensis*, Lefèv.

Jacoby, Fauna of British India, Coleoptera, Chrysomelidæ, vol. i, 1908, p. 503.

Lefèvre, in his original description (Bull. Soc. Ent. Belgique, xxxv, 1891, p. cclxxvi) called this species "*andamansis*," but Jacoby has changed it into *andamanensis*. The type specimen,

<sup>1</sup> Recorded by Duvivier from Konbir, Bengal, Ann. Soc. Ent. Belg., xxxvi, 1892, p. 414.

which is in the Museum collection, is labelled *C. andamansis*, in Lefèvre's handwriting.

The following are a few species which have been recorded from within Indian limits and which have been omitted by Jacoby. The author's description of each species is quoted, so that it may be available to workers in the group in India.

*Coptocephala dubia*, Baly.

Baly, Scient. Results, Second Yarkand Mission, 1878-91, Coleoptera, p. 25.

"*Subelongata, subcylindrica, nitida, subtus nigra, argenteo sericea, prothorace pedibusque fulvis; supra fulva, capitis vertice nigro; thorace lævi; scutello piceo; elytris tenuiter punctatis, fasciâ communi baseos, extrorsum abbreviata, alterâque vix pone medium nigris.*"

"Long.  $2\frac{1}{3}$  lin."

"Vertex black, impunctate, lower face fulvous, a ray of the same colour extending upwards on the vertex; front deeply excavated between the eyes, irregularly punctured; anterior margin of clypeus concave-emarginate. Thorax rather more than twice as broad as long; sides rounded, converging from behind the middle to the apex; the anterior angles obtuse, the hinder ones rounded; disc transversely convex, shining, impunctate, excavated on either side near the lateral margin. Scutellum trigonate, piceous. Elytra scarcely broader than the thorax, parallel, very finely punctured; the black markings on their surface extend from the base nearly to the middle of the disc, and again from the middle itself nearly to the apex, leaving only an irregular flavous transverse band across the middle, which sends a narrow ramus along the suture nearly to the base."

"*Hab.*—Murree." (Baly.)

One specimen from Murree, W. Himalayas, is in the Indian Museum collection; it was named by Baly and is a "type" or "co-type."

*Cryptocephalus interjectus*, Baly.

Baly, Scientific Results, Second Yarkand Mission, 1878-91, Coleoptera, p. 26.

"*Elongato-oblongus* ♂, *oblongus* ♀, *convexus, nitidus, subtus niger, pedibus nigro-piceis; supra flavus, capite hic illic parce fortiter punctato, fronte sulco longitudinali impresso; vertice, maculis duabus inter oculos, labro, antennisque nigris, his basi, sulco longitudinali, mandibulisque piceis; thorace lævi, limbo angusto et utrinque maculâ subrotundatâ nigris; scutello subcordato, nigro; elytris fortiter punctato-striatis, punctis piceis, apicem versus minus fortiter impressis; interspatiis convexis, transversim rugulosis; utrisque limbo angusto, externo ante medium excepto, maculisque quinque 2, 2, 1, dispositis nigris.*"

"Long.  $2\frac{1}{2}$  lin."

"Var. A. *Pygidio corporeque subtus flavis, illo maculâ cuneiformi pectore, abdominisque disco nigris.*"

"Var. B. *Corpore nigro, antennarum basi, clypeo, faciei signaturis, thoracisque lineâ longitudinali sordide flavis.*"

"Head rather coarsely but not closely punctured, the puncturing varying in degree in different individuals; front impressed with a distinct longitudinal groove; clypeus broader than long, trigonate; antennæ three-fourths the length of the body in the ♀, rather longer in the ♂, the three lower joints pale piceous, the rest black. Thorax rather more than twice as broad as long at the base; sides moderately rounded and obliquely converging from base to apex; basal margin concave-emarginate on either side, the outer angles produced backwards, acute; above convex, minutely but not closely punctured. Elytra slightly broader than the thorax, oblong quadrate, convex, rather strongly punctate-striate, the punctures piceous, finer, and less strongly impressed towards the apex; interspaces faintly but distinctly convex, transversely wrinkled; each elytron with the extreme outer limb (interrupted on the lateral margin before its middle) and five large patches black; these spots are arranged as follows: two transversely below the base, the outer one oblong, covering the humeral callus and attached to the basal margin, the inner one subrotundate, placed on the inner disc; two just below the middle also placed transversely, both subrotundate, the outer one usually attached to the lateral margin; and lastly, one apical, transversely oblong, either free or attached to the apical border; these patches are often more or less confluent, and occasionally, as in var. B, cover the entire surface of the elytron. Pygidium and body beneath clothed with griseous hairs. Apical margin of prosternum obliquely produced, deflexed, slightly emarginate, the hinder margin concave, armed on either side with a deflexed, obtuse tooth; mesosternum transverse, its apical border angulate-emarginate. Apical segment of abdomen in the ♂ impressed with a shallow fovea; the same segment in the ♀ deeply excavated, the fovea large, rotundate. Basal joint of the four anterior tarsi in the ♂ dilated, elongate-ovate, longer than the following two united."

"The form of the prosternum will separate this species from any nearly allied species."

"Hab.—Murree." (*Baly.*)

There are three specimens in the Museum collection named by Baly. The "type" and var. B, from Murree, and var. A, from the Jhelum Valley, N.-W. Kashmir.

*Paria cuprescens*, Baly.

Baly, Scient. Results, Second Yarkand Mission, 1878-91, Coleoptera, p. 28.

"*Anguste ovata, subtus cum capite picea, pedibus, antennarumque basi pallidus; supra cuprea, thorace sub-conico, vage punctato; elytris regulariter punctato-striatis, interspatiis planis, impunctatis.*"

"Long.  $1\frac{1}{4}$  lin."

"Vertex swollen, shining, impunctate; clypeus transverse, its anterior border emarginate; antennæ, rather more than half the length of the body, piceous, the two lower joints paler. Thorax broader than long at the base; sides straight and obliquely converging from base to apex, the hinder angles very acute; basal margin oblique on either side, the median lobe obtusely rounded; disc sub-cylindrical, impressed, but not closely, with very shallow punctures. Elytra ovate, attenuated at the apex, regularly punctate-striate, the interspaces plane, each impressed with an irregular row of minute punctures; humeral callus thickened."

"Hab.—Jhelam Valley." (Baly.)

The collection contains a specimen of the above species, named by Baly, from the Jhelum Valley. It is not in very good condition, having one elytron missing.

*Corynodes bengalensis*, Duviv.

Duvivier, Bull. Soc. Entom. Belgique, xxxiv, 1890, p. cxliii.

The short diagnosis of this species is given below. A more detailed description in French, comprising about three-quarters of a page will be found in the above work, p. cxliv.

"Oblong, convexe, entièrement d'un vert brillant mélangé de pourpre et de violet. Antenne noires à reflets violacés avec la base brune. Massue de cinq articles. Tête et elytres densément ponctuées ces dernières à ponctuation subsériale. Corselet à ponctuation éparse. Crochets des tarses appendiculés."

"Long. 10 mill.—Tetara (Mission du Bengale occidental)." (Duvivier.)

There are two specimens in the collection. One from Mandar, Bengal, was returned named by Jacoby, Clavareau having compared it with the "type," and the other without a locality was named by the Paris Museum.

## XLI. SIX NEW CICINDELINÆ FROM THE ORIENTAL REGION.

By DR. WALTHER HORN, *Berlin*.

### *Cicindela lefroyi*, sp. nov.

Differt a *Cicindela vittigera*, Dej., prothoracis parte intermedia et antica latiore; elytris postice minus distincte serrulatis, spina suturali ♀ minus retracta, margine laterali ad angulum apicalem externum magis rotundato declivi; signatura: puncto basali minore et obliquo (extus et posticem versus descendente), maculis juxta-suturalibus vix brevioribus, fascia media discoidali et antice et postice evidenter abbreviata (antice non extus, postice vix intus curvata); macula apicali anteriore rotundata (non oblonga), posteriore hujus minus approximata; genis nudis plus minusve cyaneis; iv antennarum articulo ♂ non penicillio longo sed solummodo setis 2 brevibus flavis distantibus ornato. Long.  $12\frac{3}{4}$ - $15\frac{1}{2}$  mm. (sine labro).

♀ ♂, Pusa, Chapra (Bengal), collected by Mr. H. Maxwell Lefroy and sent to me by my friend Mr. H. E. Andrewes.

The bald cheeks, the broad prothorax and the shortened middle band of the elytra, which is almost straight, are the principal features of this new species, which has been caught together with *Cicindela vittigera*, Dej. Front and pronotum are coppery with a bluish-greenish tinge at the ordinary places; the elytra show an opaque velvet-like black, except at the lateral margin and the base, both of which are (not velvet-like) dark green or bluish black. The pro-episterna are densely clothed towards the coxæ with white bristles, elsewhere bald. The margins of the abdomen and of the metasternum, the meta-episterna (bald in the centre), meso-episterna and meso-episterna (laterally bald) also clothed with white bristles. The apex of the suture of the elytra of the ♂ only a little, of the ♀ moderately, retracted.

### *Cicindela alleni*.

Species intermedia inter *Cicindela nivicinctam*, Chvr., et *C. limosam*, Saund., genis pilosis; ceteris capitis partibus nudis, quibusdam pilis supra antennarum insertionem positis exceptis; fronte inter oculos excavata (oculos versus etiam perparum magis erecta quam in *C. limosa* subtilissimeque—fere aequaliter atque in *C. nivicincta*, subtilius quam in *C. limosa*—striolata); prothorace omnino ut in hac specie, i.e., lateribus leviter rotundatis, basi angustata, marginibus lateralibus pronoti sparsim pilosis; elytris

angustioribus quam *C. nivicincta* (multo angustioribus quam *C. limosa*), postice obliquius quam in his duabus speciebus prolongato-truncatis, spina suturali perparum (ut in *C. limosa*, ♂) retracta. Cetera ut in illis 2 speciebus. Long. 9 mm.

One ♂ sent to me by Mr. *John Hewitt*, Director of the Sarawak Museum, caught by the Rev. *Dexter Allen* near Betong (Borneo).

Very closely allied to *C. limosa* and *nivicincta*, agreeing in the brassy-greenish coloration of the whole body. The first four segments of the antennæ are green, the legs brassy-green with reddish knees, the palpi, trochanters and almost the whole tibiæ testaceous, the tarsi testaceous and green. The labrum is short, transversely truncated, with only two short teeth arranged at a certain distance from the middle. Front, vertex, pronotum exceedingly finely shagreened, elytra closely and not finely punctured, with a narrow, yellow, marginal line, running from the shoulder to the tip. The striking features of the plain-looking new species are: the hairy cheek, the few bristles above the insertion of the antennæ, the very fine striation of the fairly erected part of front towards the eyes, the slightly rounded prothorax narrowed to the base, the small elytra and the hardly retracted sutural spine.

### *Cicindela crassipalpis.*

Species *Cicindelæ westermanni*, Schaum, affinis; labro ♀ antice perparum magis angustato-producto (♂ *C. westermanni* mihi deest!); fronte latiore in partibus medianis irregularius minusque longitudinaliter striolata; prothorace multo latiore, lateribus valde rotundatis, maxima latitudine pone strangulationem anticam rita (formam *C. tetragrammicæ* referens, sed latera minus recta), pronoto-toto (disco sparsim) setosa; elytris in medio fere eadem latitudine atque in *C. westermanni* sed minus convexis, basim versus multo minus angustatis, totis sat velutinis (margine lato aenescente excepto), solummoda serie una foveolarum minorum viridium juxta suturam ornatis; signatura differente: macula apicali virguliformi fere eadem, altera brevi obliqua (intus et posticem versus descendente: aut recta aut in medio angustata) discoidali pone medium sita margini magis approximata quam suturae, puncto minore rotundato fere in medio inter hanc et angulum humeralem posito (a margine aequaliter atque macula media distante). Long. 9-12½ mm. (sine labro).

One ♂, two ♀ ♀, in the collection of my friend *A. E. Andrewes*, *Capt. Downing* and my own. Collected by *Capt. A. K. Welt Downing* in October 1907 at 1,000 feet elevation at Potanur (Coimbatore district).

Labrum testaceous, ♀ long, roundly prolonged with only one (strong) tooth in the middle, ♂ broad and transverse (the only middle tooth smaller); head and prothorax coppery, sculptured somewhat as in *C. catena*, much broader in ♀ than in ♂; the whole head bald; the elytra rather parallel, ♂ very little (♀ moderately)

ampliated near the middle, with a velvet-like surface (the broad lateral margin excepted), brown in ♀, greenish-blackish in the only ♂, rather convex (although less than in *C. westermanni*), broadly rounded behind, with a minute not retracted sutural spine. Punctuation of the elytra fine, little visible (margin excepted); pattern broad, as described above. Under side coppery, abdomen bluish-cyaneous with the whole of the lateral parts of the pectoral region of the metasternum and of the first 4-5 abdominal sternites densely clothed with white bristles. First four segments of antennæ coppery; legs, ♂, more greenish above, more coppery below, ♀ as well as almost all tibiæ and tarsi ♀ ♂ more or less testaceous; palpi testaceous, only tips of last joint darkish.

*Therates spinipennis*, Latr., *xanthophobus*.

Differt a forma prioritatis (*spinipennis*, Latr.) macula flava humerali elytrorum nulla, labro aut toto aut maxima ex parte (solummodo antice medio testaceo), palpis maxillaribus totis, maxima mandibularum primique antennarum articuli parte nigricantibus; femoribus longius obscuratis; pronoti parte intermedia plerumque paullo minus globosa. Long. 11-13½ mm. (sine labro spinaque).

♀ ♂, Palembang (Sumatra), my collection, caught by Mr. Bouchard.

The most remarkable feature is that even the greatest part of the labrum becomes blackish (at least the base of both of the lateral margins). A small patch near the base of the mandibles seems always to be testaceous. The hind hips have only a yellow tip.

*Therates spinipennis*, Latr., *xanthophilus*.

Differt a forma prioritatis (*spinipennis*, Latr.) labro, primo et antennarum (supra perparum obscurato) et palporum maxillarium (articuli 2 ultimis obscurioribus) articulo, mandibulis (apice excepto), maxima coxarum posticarum parte (solummodo parte basali et laterali nigricante), totis femoribus, tota parte basali elytrorum (macula scutellum versus angustata et plerumque huius apicem attingente), abdomine flavis; tibiis tarsisque plerumque brun, nescentibus; statura minore; elytris nigris, non aut vix metallice indutis, brevioribus, totis paullo grossius punctatis, disco quoque sparsim punctato. Long. 10¼-11½ mm. (sine labro spinaque).

♀ ♂, Mentawai Island, Sipora; collected by Modigliani, v-vi, 1894.

The contrast between the obscure black (almost always without any metallic lustre) coloration of the elytra and the enlarged straw-like yellow humeral patch is very striking. The last is almost as broad as long. *Therates spinipennis versicolor*, Bat., is described as being larger than the typical form and metallic on the disc of the elytra, which are not punctured and show a small humeral spot.

*Therates gestroi annandalei*, sub-sp. nov.

Differt a forma prioritatis (*T. gestroi*, W. Horn, from Lakhon) orbitis altius rectiusque positis, intermedia prothoracis parte angustiore, lunula humerali flava multo longiore (tertiam elytrorum partem evidenter superante), macula basali item majore et cum illa connata et suturem versus paullulum descendente, macula discoidaei media flava transversa vix majore, tota elytrorum parte apical. (aut quarta aut quinta) indistincte flavescente. Long. 7-8 mm. (sine labro).

♀ ♂, Kurseong, 5,000 feet, common in damp shady places, 3-5-vi-1908, caught by Dr. N. Annandale.

The anterior half of the elytra shows exactly the pattern of *Therates kraatzi*, W. Horn, from Penang, but the discoidal patch of the latter is much larger; on the other hand the apex of the elytra of the new form is much more broadly yellowish coloured. The two deep longitudinal sulci in the middle part of the front of *T. gestroi* and its sub-species are parallel, its interspace flat and smooth; in *T. kraatzi* there is a slight depression in the centre of this part towards which the two sulci converge a little: only the anterior part before the convergence is smooth, all the remainder of the middle part is just a little obliquely, longitudinally striated. The prothorax of the Penang species is broader than that of *T. gestroi annandalei* and its extreme apex shows a distinct but slight transverse emargination.



XLII. DESCRIPTION OF AN *AGRIOLIMAX*  
FROM GYANTSE, TIBET, COLLECTED BY  
CAPTAIN F. H. STEWART, INDIAN MEDICAL  
SERVICE, WITH DETAILS OF ITS  
ANATOMY.

By *Lieut.-Col.* H. H. GODWIN-AUSTEN, *F.R.S., F.Z.S., etc.*

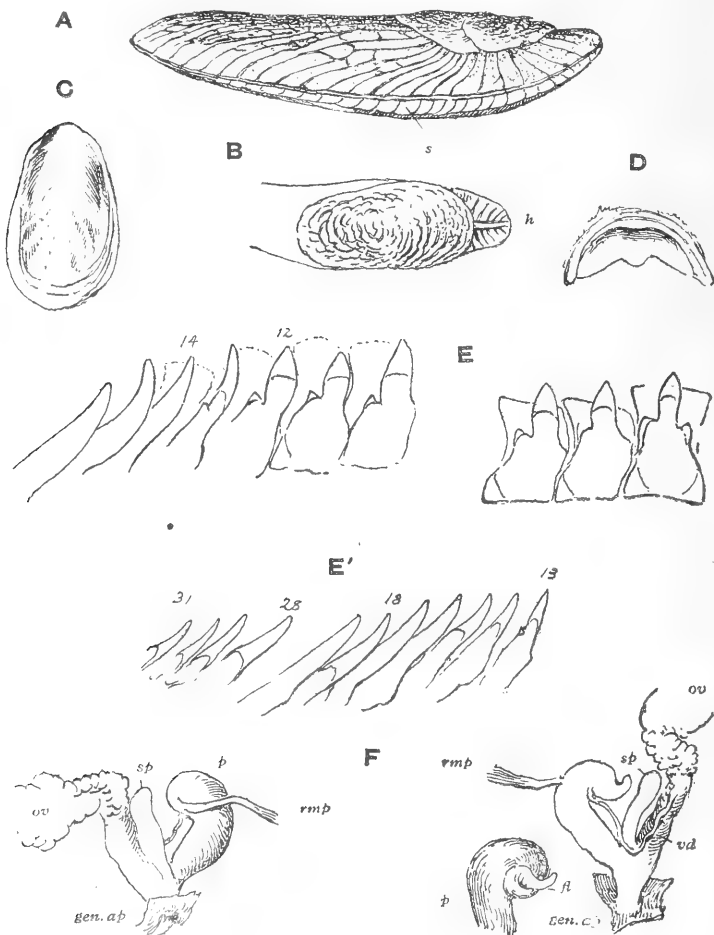
Some specimens of slugs have lately been placed in my hands by Dr. Nelson Annandale, Superintendent of the Indian Museum, Calcutta. Considerable is the interest attached to them because they were collected by Captain F. H. Stewart, I.M.S., on the 11th September, 1907, at Gyantse, in Tibet, at an altitude of 14,500 feet, and are the first slugs to have been obtained in that part of Tibet.

There were two tubes, one marked No. 88 containing two specimens, the largest of the lot, and another, No. 58, twelve specimens much smaller in size of a paler colour: colour, however, in spirit specimens is not of much value, and I can detect no difference in the outward form, nor in the groovings on the body of the large and small specimens, nor in the formula of the radula. The internal anatomy of the two largest was well seen and proves these slugs to belong to the genus *Agriolimax*, the nearest species being *Agriolimax campestris* var. *hyperborea*, as described in the Monograph of the Land and Freshwater Mollusca of the British Isles by Mr. John W. Taylor, p. 135,—a species with a northern habitat in both the Old and New Worlds. As I shall show further on, there are differences between the two, which, considering the very small differences which constitute varieties of *campestris* (such as *occidentalis*, Cooper, of California; *montanus*, Ingersoll; *castanea*, Ingersoll; *intermedius*, Cockerell; and *tristis*, Cockerell, of Colorado) I think render this Tibetan form quite worthy of similar distinction.

*Agriolimax tibetanus*, sp. nov.

Animal 17 mm. in length, pale umber brown in spirit; the mantle and dorsal surface of foot much darker, nearly black. The mantle is anterior in position and has semi-concentric foldings on the hinder part, concentric and given off from the right anterior edge on the fore part; two parallel grooves run down the top of the neck, which are joined on both sides by the main lateral grooves. These last on the side of the animal are very distinctive, deep and well defined; on the rounded dorsal side of the foot these lateral intervals are first broken up into parallelograms, and then, running closer together, form oblong

close-set tubercles. The sole of the foot is tripartite, and it has an edge of narrow elongate tubercles, and the outermost area of the sole is broken up into quadrate spaces corresponding in their length to the spaces between the lateral grooves. Tentacles black.



*Agriolimax tibetanus*, sp. nov.

- A = Animal viewed from right side,  $\times 3.6$ ; s. = sole of foot.  
 B = Mantle viewed from above showing dorsal grooves,  $\times 3.6$ .  
 C = Shell,  $\times 7$ .  
 D = Jaw,  $\times 20.5$ .  
 E = Teeth of the radula, central and admedians,  $\times 720$ .  
 E' = " " " laterals,  $\times 316$ .  
 F = Genitalia,  $\times 7$ .

The internal anatomy showed that both the largest specimens (No. 88) were adult, the oviduct being large and jelly-like. The albumen gland was also large and of conspicuous ruddy brown colour, and occupied the posterior median portion when the animal

was removed from its enveloping integument. There were not enough specimens to determine the coils of the intestine, but the rectum was well seen. The retractor muscles of the eye-tentacles are situated on the posterior end of the mantle, and the branchial cavity, the heart lying on the anterior side.

The generative organs were well seen and mounted.

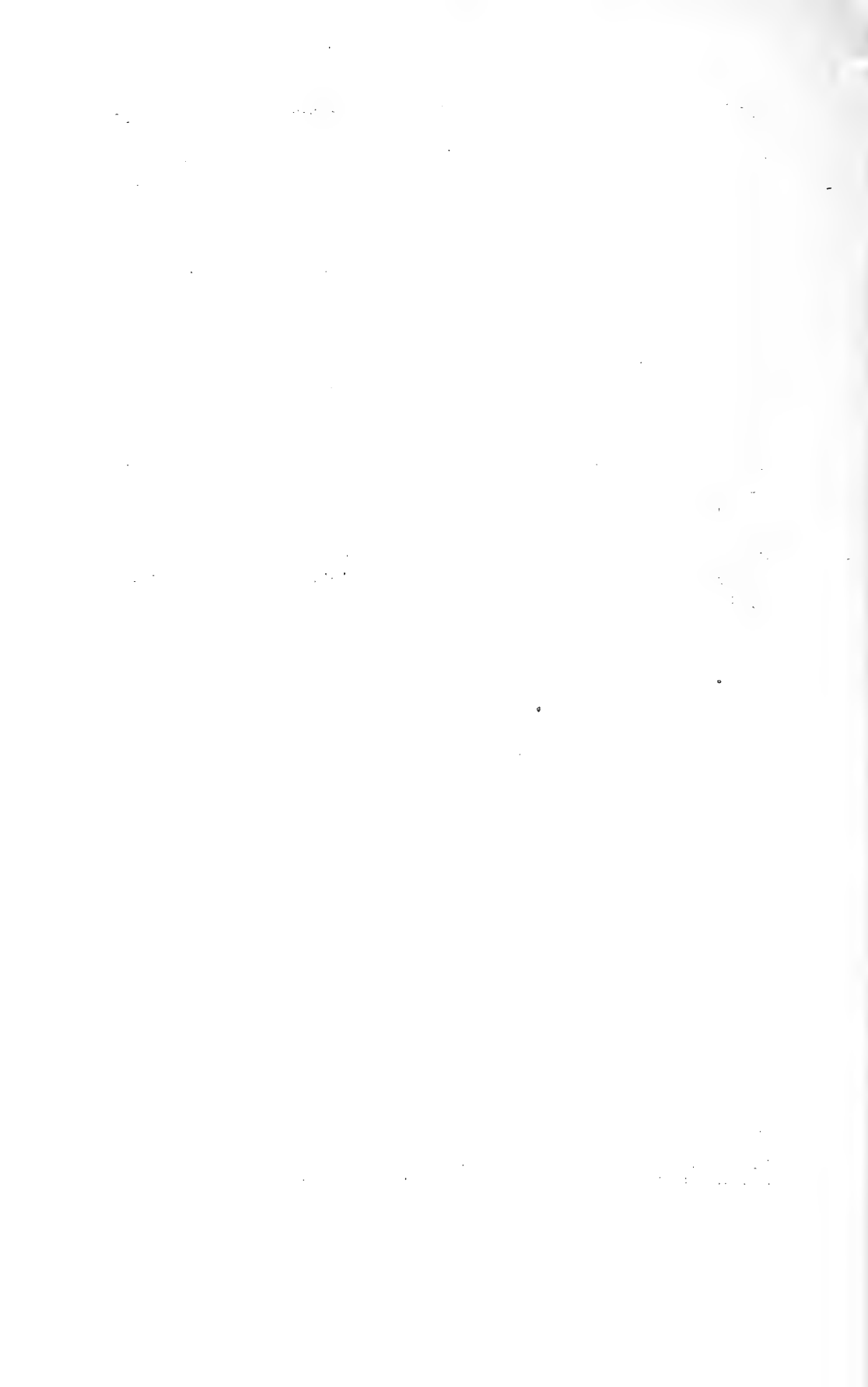
The penis is a simple, short, thick tube with a globose head giving off a small, tightly-coiled, what may be termed flagellum, or rather its homologue; the vas deferens joins it on one side and the retractor muscle on the other. The spermatheca is short, club-shaped, and lies close against the free oviduct. The vas deferens is very short. I could not find any *excitatory* organ, which Semper shows exists in *Agriolimax lævis* (*vide* p. 122, Moll. British Isles). The generative organs are of the same type, only differing in minor details.

The peculiar character of this species is the strong lateral grooves on the side of the foot, running from the peripodial groove upwards. Taylor's description of *Agriolimax agrestis* does not apply to this species. The teeth of the radula are similar in form to those of *Agriolimax hyperborea* (Westerland); the laterals being curved and aculeate, but there are far fewer of them. I got the radula out in a very perfect state, and the formula is 17.2.12.1.12.2.17. or 31-1-31; in *hyperborea* it is 42-1-42, laterals 12 in number, marginals about 30; it shows the two species are very close to one another.

Jaw moderately arched with a small central projection.

Shell thin, glassy, transparent, milky white, flat, elongately ovate, widening in breadth gradually to the anterior edge, with a rounded apex.

[NOTE.—The specimens described above by Colonel Godwin-Austen were found under stones in a small mountain stream at High Hill Gumpa. The smaller specimens (from tube No. 58) were taken on the 16th July, the larger (tube 88) on the 11th September. On the 29th March I had found under stones in the same locality two eggs which presumably belong to this species. They were spherical, 2 mm. in diameter, and had very thick, tough, laminated, membranous shells. Floating loose in the cavity of the shell was an embryo in an early stage of development, roughly spherical and showing a differentiation into a thin outer layer and an inner cellular mass. These two eggs were placed in water in a tube and kept in a room of the Trade Agency at Chang-lo. On the 10th April the embryos had begun to assume a slug-like form, but they showed no haste to break through their shells, and it was not until the middle of May that they introduced themselves to the outer world. Although this collecting-ground was regularly visited, no adult slugs were found until July.—F. H. STEWART.]



# XLIII. REVISION OF THE ORIENTAL LEPTIDÆ.<sup>1</sup>

By E. BRUNETTI.

The present paper is an endeavour to recognise the described Oriental species in this family and to add some new ones existing in the Indian Museum collection. Some of these latter bear names by Bigot (apparently *nomina nuda*), with "sp. nov." affixed, and these I have described herein. Most of them are placed wrongly, generically, and one "sp. nov." which he calls "*Leptis dichroma*" is a *Plecia* (*Bibionidæ*) and is in too dilapidated a condition to describe. My thanks are due to Mr. C. O. Waterhouse of the British Museum for some valuable information respecting some of Walker's types and Rondani's genus *Leptipalpus*, and also to Prof. M. Bezzi for notes on the latter genus.

## SURAGINA, Wlk.

- |                              |    |    |          |
|------------------------------|----|----|----------|
| 1. <i>illucens</i> , Wlk.    | .. | .. | Celebes. |
| 2. <i>signipennis</i> , Wlk. | .. | .. | Gilolo.  |

Walker mentions the great length of the discal cell ("nearly six times longer than broad") as characteristic of his genus, and Osten Sacken notes its affinity with *Atherix* (Berl. Ent. Zeits., xxvi, 101); as Walker had labelled with the generic name *Suragina*, the specimen which Osten Sacken makes the type of his species *Atherix limbata*. The latter author seemed doubtful of the validity of *Suragina*. Osten Sacken does not mention the proportionate shape of the discal cell in his *limbata*. In the five species of *Atherix* that I have been able to examine it is only from 3 to 4 times longer than broad, and in the two common European species (*marginata* and *ibis*) only slightly over 3 times. (In my measurement, I have regarded the "breadth" as its breadth in the middle—or the average breadth.)

Failing a comparison with types, it is well to let *Suragina* stand provisionally. Moreover Walker says the antennæ have the third joint round, whereas in *Atherix* it is kidney-shaped.

From the descriptions, *S. illucens* is a cinereous black species, with two large lateral testaceous spots at the base of the abdomen, the tip of which is also testaceous; whilst in *S. signipennis* it is black, with hoary tomentum. The legs are differently coloured, but the size of both species is about identical.

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<sup>1</sup> Since concluding this and the succeeding paper, I have seen two new species of *Chrysopilus*, two of *Bombylius* and one of *Geron*, all acquired by the Indian Museum: these will be described shortly.—E. Brunetti.

**ATHERIX**, Mg.*Table of Oriental species.*

- A Abdomen with distinct red or yellow markings.
- B Hind femora without a distinct ring near tip.
1. All the femora wholly reddish tawny .. *nigritarsis*, Dol.
  2. Basal half of all the femora black.  
Basal half of abdomen all tawny: wings with distinct, wide brown stripe in middle .. *calopa*, mihi, sp. nov.  
Abdomen mainly black, but base at sides reddish tawny: wings pale brown with indistinct darker band in middle .. *lanopyga*, mihi, sp. nov.
  3. All femora wholly black, except base of "posterior" femora .. *labiata*, Big.
- BB Hind femora brownish yellow, with a broad brown ring before the tip .. .. *limbata*, Os. Sac.
- AA Abdomen practically all black: at most a bluish grey band at base, or first segment pale yellow.
- C Abdomen with bluish grey transverse band towards base: hind metatarsi normal .. .. *cincta*, mihi, sp. nov.
- CC Abdomen with first segment pale yellow: hind metatarsi distinctly and uniformly thickened .. *metatarsalis*, mihi, sp. nov.

**Atherix limbata** (?), Os. Sac.*Redescription.*

(Plate xii, fig. 4, ♀, wing.)

♀. Lower Burma. Long. 8 mm.

*Head*.—Vertex cinereous grey with a few blackish hairs, upper half of frons dull coal-black, lower part bluish grey with (seen from above) a central small black spot, lower part of face blackish grey, proboscis brown. Antennæ blackish grey with a few hairs at base, third joint tawny, arista long. Eyes blackish. Back of head bluish grey, with a fringe of light hairs, which are longest behind the sides of the eyes. Palpi black, hairy below.

*Thorax*.—Dorsum aënous black, the colour not attaining anterior margin except as a wide stripe in the centre, but extending to both wings and to the scutellum. Humeral calli tawny, with a whitish grey tomentose spot, contiguous to each, on the anterior border. A bluish grey spot in front of each wing, placed almost on the dorsum. Sides of thorax yellowish grey posteriorly; mesopleuræ bluish grey. Scutellum yellow, base blackish; metanotum blackish grey.

*Abdomen*.—Brownish yellow, with a black dorsal stripe on first three segments, which spreads out over the greater part of the fourth and fifth segments, tip of abdomen yellow, sides with a blackish line and a fringe of black hairs mixed with some paler ones. Belly yellowish. Some short pale hairs over the dorsal surface of the abdomen.

*Legs*.—Fore coxæ yellowish with bluish grey reflections, posterior coxæ blackish, all of them black at the junction with the femora, which are yellow, with the tips narrowly black, the middle pair having a very small black streak on the under side near the base, and the hind pair a wide black ring in the middle. Remainder of legs black, but middle tibiæ dark brownish yellow.

*Wings*.—Pale grey, a rather dark brown middle stripe from the centre of the costa, narrowing posteriorly and reaching hind margin of wing at tip of anal cell; distal part of wing dark grey, down to the fifth posterior cell, the centre of which is pale grey (reaching to the border) but a rather wide pale grey space remains between the dark brown stripe and the distal dark grey part, this clearer part ceasing at the fifth posterior cell. Fifth longitudinal vein dark brown suffused. Wing rather strongly iridescent. Upper transverse vein placed just before one-third of the discal cell. Halteres yellowish, knob black.

*Described* from a single perfect ♀ in the Indian Museum collection captured by Dr. Annandale.

*N.B.*—I describe under the above specific name a ♀ specimen (now in the Indian Museum collection) captured by Dr. Annandale at the base of the Dawna Hills, Amherst District (Lower Burma), on 1-iii-08, and which I at first thought was a new species. It differs from *limbata*, O.S., by the presence of the clearer space in the dark distal part of the wing, and by the hind femoral band being in the middle, not near the tip; other minor differences hardly being specific. My augmented description may enable others to identify it definitely either as *limbata* or as new.

**A. nigritarsis**, Dol.

**A. limbata**, Os. Sac.

**A. calopa**, mihi, sp. nov.

The two former are very closely allied, as noted by the late Baron Osten Sacken (Berl. Ent. Zeits., xxvi, 100) in describing his species from the Philippines. My *calopa* is also near both, yet I believe all three species to be distinct.

***Atherix lanopyga*, mihi, sp. nov.***(Chrysopila lanopyga, Bigot, nom. nud.)***(Plate xii, fig. 3, ♀, full insect.)**

♀. Assam. Long. 10 mm.

*Head*.—Rather more than the upper half of frons velvet-black, remainder of frons, the vertex, and face below antennæ, blackish, with bluish grey reflections. Antennæ, two basal joints brown (third missing). Eye facets of uniform size. Proboscis and palpi blackish, the latter pubescent above and below. Back of head blackish grey with a continuous fringe of short grey hair.

*Thorax*.—Black, with whitish grey reflections at the sides and on the humeri. Scutellum black, with black hairs; posterior border brown.

*Abdomen*.—Mainly black. First segment dark brown, the colour extending as a wide dorsal stripe across the second; sides of first two segments occupied by a large, light yellow translucent spot. Third segment velvet-black, with a bicoloured spot at the sides of the posterior border, the anterior half of this spot being orange, and the posterior half grey; the orange colour extending along the sides of the abdomen in a streak, until it reaches the large translucent side spots in front of it. Remaining segments black, whitish grey posteriorly, the sides of the sixth and seventh being light orange-brown. Anal process black. Dorsum of abdomen with yellowish hair, which at the tip becomes brown. Belly yellow, with soft, yellow hair, the middle segments with some irregular black marks.

*Legs*.—Coxæ brown, with bluish white shimmer, and soft, silky white hair; femora yellow, base of fore pair and basal half of middle and hind pairs, light brown; tibiæ brownish yellow, hind pair darker; tarsi brownish black. The femora have a little pale yellow hair, which is brown on the tibiæ, bright golden brown on hind pair and black on the tarsi.

*Wings*.—Pale grey, a faint brown streak from the elongated brown stigma reaches nearly to the posterior border: a small, elongated, clear spot in the middle of the discal and of the fifth posterior cells. Discal cell  $3\frac{1}{2}$  times as long as broad. Halteres yellow, knobs black. Tegulæ pale yellow, transparent.

*Described* from one ♀ in good condition in the Indian Museum collection from Sadiya (Assam).

***Atherix calopa*, mihi, sp. nov.***(Id. id., Bigot, nom. nud.)***(Plate xii, fig. 2, abdomen, ♂.)**

♂. Assam and Tenasserim. Long. 8 to 10 mm.

*Head*.—Vertex black; frons blackish with bluish grey shimmer; proboscis and palpi blackish, the latter hairy below.



Antennæ brownish yellow, with a trace of bluish grey dust on upper side of two basal joints. Back of head blackish grey, with a thick fringe of long whitish grey hair which is absent on the upper part. Lower facets of eye barely smaller than upper ones.

*Thorax*.—Dark brownish black, moderately shining: humeri shining brown; sides of thorax brown, light bluish grey dusted. Scutellum dark brown, with erect brown hairs.

*Abdomen*.—First four segments mainly yellow, but dark brown at the upper side of the first at the base, and a narrow dark brown dorsal line, with a narrow line at each side of the abdomen; these three lines extending over the four segments. Posterior border of fourth segment dark brown, the colour extending forward in the centre, till it joins the dorsal stripe. Remainder of abdomen dark shining brown, the posterior border of each segment bearing a little bluish grey dust. Belly yellowish. The whole abdomen with moderately long hairs of similar colours to that of the respective parts on which they are placed. Genitalia moderately large, dark brown, shining, with black hairs.

*Legs*.—Coxæ, dark brownish with bluish grey shimmer; femora yellow, basal third in fore pair, basal half in middle pair and basal two-thirds in hind pair black; tibiæ yellow, knees brown; basal half of tarsi yellow, apical half black. Legs with very short black hairs.

*Wings*.—Very pale grey, apical half a little darker; discal cell three times as long as broad; no distinct stigma; a brownish irregular streak from the centre of the fore border, reaching to about half way across the wing. Halteres yellow, knobs black; tegulæ blackish with yellow edges.

*Described* from three ♂♂ in fairly good condition, in the Indian Museum collection. The type is from Sadiya and the others from Tenasserim.

***Atherix cincta*, mihi, sp. nov.**

(Plate xii, fig. 1, wing.)

♀. Assam. Long. 10 mm.

*Head*.—Frons dull black, bare, the part immediately above antennæ with ash-grey reflections and a few hairs. Vertex blackish, only slightly indented; ocelli dull red-brown. Eyes brown, with a bronze reflection, facets of uniform size. Back of head grey, with a fringe of short, black hairs on upper half, which are replaced by longer, scattered white hairs on lower half. Antennæ dark brown, normal, first joint hairy above only, second joint hairy above and below. Face below antennæ ash-grey: palpi and proboscis cinereous grey, with scattered hairs, the former with some strong black hairs at tip.

*Thorax*.—Ground colour blackish, with traces of cinereous grey close pubescence, which in perfect examples probably covers all the dorsum and sides; with also some scattered longer hairs over the whole thorax. Scutellum blackish, with scattered yellowish

grey hairs and reddish brown posterior border carrying a fringe of black and grey hairs.

*Abdomen*.—Shining dark blackish brown, shoulders prominent, forming tawny brown calli with grey hair. The under side of the first segment is in front continued in a yellow scaly process extending downwards till it reaches the hind coxæ. The first and second segments are occupied by a pale bluish grey transverse band, narrowly interrupted in the middle, and extending over the sides to a considerable extent. This band carries pale concolorous hair which is continued along the lower sides of the whole abdomen to the tip. The dorsum is clothed with short black pubescence which, beginning with the third segment, extends round the sides until it meets the line of grey side hairs. A very narrow bluish grey border to the fourth and fifth segments, the extreme edge in the fifth and sixth segments being orange-brown.

*Legs*.—Blackish brown, minutely pubescent: apical half of all femora and the whole of the middle tibiæ reddish tawny. Some whitish grey hairs below femora; hind tibiæ shortly pubescent, with reddish bronze reflections.

*Wings*.—Pale grey, apical half pale brownish. No distinct stigma, but an ill-defined rather broad brown band runs from the stigmatic portion of the costa towards the posterior border, but fades away before reaching it. Discal cell three times as long as broad; anal cell closed just before the border. By a strong convergence of the veins the fourth posterior cell (*termin*, O.S.) is almost closed; thus (if a stable specific character) separating this species from all other Oriental species in this genus. Halteres yellowish, knobs black, rather large. Tegulæ cinereous grey.

*Described* from one ♀ from Margherita, and two ♀ ♀ from the base of the Dawna Hills, Amherst District, Lower Burma, the latter taken by Dr. Annandale, 1-iii-08; all in the Indian Museum collection and in good condition.

***Atherix metatarsalis*, mihi, sp. nov.**

(Plate xii, fig. 5, wing; 6, hind leg.)

♂. Lower Burma. Long. 5 mm.

*Head*.—Vertex small, prominent, with a few bristly hairs; eyes contiguous for a moderate distance, the facets of the lower third much smaller. Antennæ pale yellow, with a few bristles and nearly straight arista. Face bluish grey, palpi black. Lower side of face with some long black hairs. Back of head grey encircled with a row of irregular bristly hairs of different lengths.

*Thorax*.—Rich shining brown with a semi-livid tinge towards the sides in front; sides with bluish grey reflections. Scutellum concolorous, with a row of minute black bristles on posterior border. Dorsum of thorax with scattered minute black bristles.

*Abdomen*.—First joint pale yellowish with a few black hairs and bristles; remainder shining black. Dorsum of second with a slight

pale yellowish tinge; whole abdomen with black bristly hairs. Belly black, pale yellow at base; genitalia black, hairy, apparently in three pieces, moderately prominent.

*Legs*.—Pale brownish yellow, posterior coxæ shining brown, middle femora brownish except at base and tip, hind femora with distal half dark brown; hind tibiæ dark brown, hind metatarsi much thickened. All the legs shortly pubescent, the hairs being softer and longer below the femora and shorter and more bristly on the tibiæ (especially the hind pair) and tarsi.

*Wings*.—Clear, with three distinct broad dark brown bands from the costa towards the hind margin: the first beginning at the basal cross-veins, filling one-half of the basal cells, and one-third of the anal cell, thence disappearing; the second is rather narrower and in exactly the middle of the wing, reaching from the costa almost to the hind border but leaving a narrow clear margin; this band encloses the inner cross-vein and nearly fills the basal half of the discal cell; the third is joined on the costa to the second by the stigma, extends nearly to the tip of the wing, leaving a narrow clear margin, and reaches the posterior border, filling the whole of the second, third and fourth posterior cells. Stigma very dark brown, filling all the cell as far inwards to just above the origin of the third longitudinal vein. Halteres rather long and prominent, pale yellow; clubs black, elongated.

*Described* from a perfect unique specimen taken by Dr. Annandale on the Dawna Hills (2—3,000 ft.), 2—3-iii-08. In the Indian Museum collection. A very distinct species, and with the appearance of a *Chrysopilus*.

### LEPTIS, Fab.

*Leptis apicipennis*, mihi, sp. nov.

(Plate xii, fig. 7, wing.)

♀. Assam. Long. 6 mm.

*Head*.—Frons and face grey dusted, with a large, shining black, inverted heart-shaped tubercle in the middle, and extending on each side to the eyes. Ocelli reddish tawny, semi-transparent, situated on the extreme vertex. First antennal joint bright tawny (rest absent). Proboscis shining chestnut-brown, bare, grey dusted at sides. Palpi large, tawny brown, hairy. Back of head semi-circular, with a weak, irregular fringe of short pale hairs.

*Thorax*.—Dorsum brown, moderately shining, sides dark greyish. Scutellum yellowish tawny, with a very few short irregular black hairs.

*Abdomen*.—Tawny with scattered pale hairs: with a blackish brown, dorsal, wide, irregular band which occupies the whole of the last two or three segments; and with a blackish irregular line on the sides of the abdomen.

*Legs*.—(Middle pair wanting.) Tawny yellow, fore tibiæ yellowish white; hind tibiæ rather brownish, paler towards tip; tarsi tawny brown.

*Wings*.—Pale grey. A moderately dark brown apical spot begins on the costa in a straight line with the fork of the third longitudinal vein, extends thence to the tip of the wing, and posteriorly until it fills half the first posterior cell, also the whole of the second posterior cell, and then, by bending slightly outwards, the greater part of the third posterior cell.

A brown streak also begins at the inner cross-vein, passes over the basal part of the discal cell, passes longitudinally through the fourth posterior cell, nearly filling it, and spreading over part of the fifth posterior cell also; and on attaining the border, extending each way, meeting on one side the hind part of the apical spot, and extending on the inner side towards the anal lobe of the wing. No distinct stigma. Halteres tawny yellow.

*Described* from one ♀ in the Indian Museum collection from Margherita. It is in fair condition, except for the absence of part of the antennæ and the middle legs.

*N.B.*—As Walker's two species of *Leptis* prove to belong to the genus *Chrysopilus* (*decisa* and *impar*), there now remain in this genus only Osten Sacken's *uniguttata*, and my new one.

***Macellopalpus fulvidus*, mihi, sp. nov.**

(*Id. id.*, Bigot, *nom. nud.*)

(**Plate xii**, fig. 8, ♀, head in profile.)

♀. Assam. Long. 10 mm.

*Head*.—Frons with a deep vertical central groove, terminating before reaching the vertex, on which the three brownish yellow ocelli are very prominent. Frons, just above antennæ, grey dusted, the remainder of it shining black, quite smooth. Face below antennæ, and cheeks, grey dusted. Antennæ brownish yellow, third joint darker, with long arista. Proboscis light brown (tip broken off): palpi blackish brown, lighter at base. Eyes black, facets of uniform size. Back of head bluish grey with fringe of yellow hair, which behind the vertex is replaced by two or three irregular rows of stout black bristles.

*Thorax*.—Light brown, with sparse, short hair. Sides with a slight yellowish tinge; metanotum lighter. Scutellum light brown. (Though in the unique type the scutellum is bare, there are traces of it having borne bristles along the posterior border; and others, to a less extent, on the dorsum.)

*Abdomen*.—Light brown, nearly bare; posterior borders of segments narrowly blackish. Belly light brown with a central blackish stripe.

*Legs*.—Missing, except the coxæ, and the femur and tibia of one hind leg. All these are uniformly light brown, the femur having a very narrow black ring at the base.

*Wings*.—Pale yellow, costal border darker yellowish brown; stigma brown, distinct. Halteres light brown, with a black spot on upper side of knob.

*Described* from one specimen in the Indian Museum collection from Sibsagar, in fairly good condition except as regards the legs. Bigot's description of his *flaveolus* is very short, and would apply to the present species, but as he marked *fulvidus* himself as a new species I presume it to be distinct.

*N.B.*—I am very strongly of opinion that *Macellopalpus* is synonymous with *Leptipalpus*, Rond. (1850), and that *Heliomyia*, Dol., is another synonym, but I allow *Macellopalpus* to stand until the ♂ is known (I have seen no mention of this sex).

It resembles *Leptis* in the large palpi, and *Chrysopilus* in the closed anal cell. If the ♂ is found to have long, thin palpi as in *ferruginea*, Wied. (♂), the three species *C. ferruginosa*, Wied., *M. flaveolus*, Big., and my *fulvidus*, would form a natural group, which would be the *Heliomyia* of Doleschall, erected for his *ferruginea* (= *ferruginosa*, Wied.).

The re-establishment of *Heliomyia* was hinted at by Osten Sacken (Ann. Mus. Gen., xvi, 421), and he also suspected that his *Chrysopila lupina* was congeneric with Wiedemann's species.

The only specimen of *ferruginosa*, Wied., that I have seen is a perfect ♀ taken by myself at Batavia, 5-vii-06; and in this the spatulate palpi seem to separate it from the other species of *Chrysopilus*, and to approximate it to *Macellopalpus*.

Osten Sacken claimed that Schiner was wrong in placing *ferruginosus* in *Chrysopilus*, as although the ♂ has the long thin palpi characteristic of the genus, the spatulate palpi of the ♀ makes the species an abnormal one, and is a sexual character only.

On the other hand, if *Leptipalpus* has long thin palpi in the ♂ and *Macellopalpus* is found to have the same, the former name must be adopted, and in that case the full synonymy of the genus and species would be as follows:—

**LEPTIPALPUS**, Rond., 1850, Nuov. Ann. d. sci. Bolog., ii, 183.

*Heliomyia*, Dol., 1857, Nat. Tijd. Ned. Ind., xiv, 402.

*Macellopalpus*, Big., 1886, Bull. So. Ent. Fr., xlviii.

1. **ferruginosa**, Wied. (*Leptis id.*, Zool. Mag., iii; Dip. Ex., i; and Auss. Zwei., i, 224. *Heliomyia ferruginea*, Dol., loc. cit. ante, pl. vii, 5.)
2. **flaveolus**, Big., 1886. (*Macellopalpus id.*, Big., loc. cit. ante.)
3. **waigiensis**, Big., 1887 (? *Leptipalpus*), Bull. So. Zool. Fr., xii, 108.
4. **fulvidus**, mihi, sp. nov. (*Macellopalpus id.*, Big., nom. nud.)

### **Leptipalpus waigiensis**, Big.

Placed by the author provisionally in this genus, the head in the type specimen being in bad condition. I have not seen the species mentioned since.

Rondani, in erecting the genus in 1850, noted its intermediate character between *Leptis* and *Chrysopilus*, having the palpi and antennæ of the former, with the venation of the latter.

### CHRY SOPILUS, Macq.

Of Oriental species this genus is the best represented in the family, as, including two species of Walker's, removed here from *Leptis*, one new species each by Herr Meijere and Prof. Bezzi, and seven new ones herein described, the total number now amounts to nineteen.

To draw up a satisfactory table of species is very difficult but the following may serve for the present, and at any rate it will show the relative positions of my new species. I have found it impossible to include Walker's two species, *maculipennis* and *guttipennis*, owing to the lines on which I have drawn up my table, as from his descriptions of the wings it is not obvious whether they would come in my group A or AA.

Of *maculipennis* he says, "Wings limpid, with three irregular brown bands; second and third bands broad, connected, adorned with several limpid spots, veins black."

Of *guttipennis* he says, "Wings ample, blackish brown, limpid towards the base and with several limpid spots, some of which are confluent, and form a band across the middle; veins black, yellowish at the base; halteres yellowish, with a black sub-apical band."

#### *Table of species.*

- A Wings either distinctly and darkly mottled (*Trypeta*-like) or uniformly dark brown. Long. 3 to 5 mm.
- B Wings mottled.
- C Upper fork of the fourth longitudinal vein, emerging with it from the upper outer corner of discal cell as well-separated veins; outer side of discal cell forming a distinct angle. Long. 3 mm. *albopictus*, mihi, sp. nov.
- CC Above veins emerging practically together from extreme upper corner of discal cell; outer side of discal cell straight. Long. 4 mm. *marmoratus*, mihi, sp. nov.
- BB Wings uniformly dark brown not at all mottled; above veins issue as in *albopictus*, outer side of discal cell with an angle. Long. 5 mm. . . . *luctuosus*, mihi, sp. nov.
- AA Wings never mottled nor dark brown. Either pale grey

yellowish or clear, with or without more or less distinct cross-bands or apical suffusions.

- D Second posterior cell enlarged, and enclosing a very opalescent oblong spot. Long. 7 mm. .. *vacillans*, Wlk.
- DD Second posterior cell (presumably) normal.
- E Cross-band (or bands) on wing with well-defined margins.
- F Apical border of wing clear, two distinct cross-bands. Long. 7-8 mm. .. .. *correctus*, Os. Sac.
- FF Apical border of wing darkened, inner cross-band incomplete or indistinct. Long. 7-8 mm. .. *lupinus*, Os. Sac.
- EE Cross-band (or bands) on wing with ill-defined margins, generally indistinct or absent.
- G Black species.
1. Wings pale grey, with brownish band. Long. 10½ mm. .. .. *segmentatus*, mihi, sp. nov.
  2. Wings unmarked, except for the stigma. Long. 6 mm. .. .. *sauteri*, Bezzi.
  3. Wings cinereous, apical half brownish. Long. 7 mm. *impar*, Wlk.
- GG Yellowish, brownish or tawny species.
- H Stigma blackish brown.
1. Abdomen tawny, with ferruginous marks; wings yellow, mixed with grey, tip infuscated. Long. 8 mm. .. .. *ferruginosus*, Wied.
  2. Abdomen tawny, with three black bands; black and stylate towards tip. Long. 10 mm. .. *stylatus*, Wlk.
  3. Abdomen light brown, centre segments lighter; wings brownish, no yellow fore border; under side of face deeper than in *ferruginosus*. Long. 6 mm. .. .. *simplex*, Meij.
  4. Abdomen cylindrical, tawny brown; segments with black posterior

- borders. Long. 10-11 mm. .. *frater*, mihi, sp. nov.
5. Abdomen conical, bases of segments blackish. Long.  $5\frac{1}{2}$  mm. .. *unicolor*, mihi, sp. nov.
6. Abdomen slender, tawny posterior borders, first three segments with dorsal band, and the greater part of remaining segments blackish. Wings clear, stigma dark brown. Long. 6 mm. .. *stigma*, mihi, sp. nov.
- HH Stigma honey yellow (*insularis*) or (presumably) not distinctly dark (*decisa*).  
Mainly yellow. Long. 8 mm. .. *insularis*, Sch.  
Mainly black. Long. 9 mm. .. *decisus*, Wlk.

*N.B.*—*C. ferruginosa*, Wied., may require removing to another genus. (Vide Note under *Macellopalpus fulvidus*.)

### ***C. albopictus*, mihi, sp. nov.**

(*Leptis albopicta*, Bigot, *nom. nud.*)

(Plate xii, fig. 9, wing.)

♀. Assam. Long. 3 mm.

*Head.*—Wholly black, front about one-fourth width of head; a vertical indentation just above antennæ, with slight greyish tomentum. Antennæ, proboscis and palpi tawny yellow.

*Thorax.*—Light tawny brown. Sides sublivid. Scutellum concolorous, with some longish hairs on posterior part.

*Abdomen.*—Dark brown, conical, posterior borders of segments lighter. Belly dark brown.

*Legs.*—Tawny yellow; femora and coxæ brighter; tarsi darker.

*Wings.*—Moderately dark brown, with pale grey patches that take the form of three irregular light bands, commencing at, or just below the costa; of which the first begins just beyond the stigma and terminates posteriorly on reaching the fork of the third longitudinal vein; the second crosses the middle of the discal cell and attains the hind border; the third crosses the second basal and the anal cell, and is merged in the light colour of the base of the wing. The centres and hind borders of the posterior cells are also pale grey. The upper fork of the fourth longitudinal vein emerges from the upper corner of the discal cell as two separate veins; the outer side of that cell forming a distinct angle. Stigma dark brown, proportionately large, and there are traces of yellow just before it and also in the basal cells. Halteres brownish yellow.



*Described* from a specimen in fairly good condition in the Indian Museum collection from Margherita (middle pair of legs wanting, but are probably coloured like the rest). Quite a distinct species from all others except *marmoratus*.

*N.B.*—Walker's *guttipennis* must be near this species, but appears distinct, and is larger.

**C. marmoratus**, mihi, sp. nov.

(*Leptis marmorata*, Bigot, *nom. nud.*)

(Plate xii, fig. 10, wing.)

♂. Assam. Long. 4 mm.

*Head.*—Vertex much elevated, light brown, the ocelli well separated and very distinct, semi-transparent, with black centres. Eyes light chestnut-brown, upper facets rather large, lower ones very small and much darker brown. Eyes contiguous almost down to the antennæ, the frons receding so much as to be invisible; the inner sides of the eyes (seen from in front), also the face below the antennæ, blackish grey. Antennæ, proboscis and palpi brownish yellow.

*Thorax.*—Moderately dark brown, with sparse gold-yellow hairs on dorsum; slightly paler at sides, and with concolorous scutellum and metanotum, the former bearing some moderately long brownish hairs.

*Abdomen.*—Dark brown; second segment, and posterior border of first segment lighter. Belly brown. Whole abdomen lightly covered with brownish hairs.

*Legs.*—Coxæ light brown. The single leg of the (unique) type (fore leg) is concolorous.

*Wings.*—Rather dark brown, with pale grey spots, of which the clearest is an oval one just beyond the stigma, reaching from the costa to the fork of the third longitudinal vein. Below this spot, follows a spot in each of the first, second and third posterior cells. There is a small one in the centre of the discal cell, which, with a small one in the fourth posterior cell and a large one in the fifth posterior cell, form a row. A small spot is at the tip of the marginal cell, and a larger one at the tip of the submarginal; whilst the whole posterior border of the wing is pale grey, spreading out somewhat in the cells and in the axillary cell. The veinlets forming the upper fork of the fourth longitudinal vein emerge practically together from the upper corner of the discal cell, the outer side of which is practically quite straight. Halteres light brown with large blackish brown knobs.

*Described* from one specimen from Sadiya in the Indian Museum collection in fairly good condition, except for the absence of nearly all the legs. I, however, do not hesitate to describe it, as it shows by its mottled wings its distinction from all other Eastern species except *albopictus*.

**C. luctuosus**, mihi, sp. nov.(Atherix id., Bigot, *nom. nud.*)

♂. Assam. Long. 5 mm.

*Head*.—Vertex, frons and face blackish; antennæ dark brownish yellow; proboscis and palpi blackish. Back of head blackish, with rather long greyish hair at the sides and below. Eyes bright brown, lower facets much smaller than upper ones.

*Thorax*.—Mouse colour, nearly bare. Scutellum concolorous with a row of long hairs on posterior border.

*Abdomen*.—Dark brown, with some yellowish grey pubescence. Belly, dark brown.

*Legs*.—Coxæ dark brown, with brownish grey hair; femora and tibiæ light brownish yellow, with sparse hair on under side of femora, and a row of minute bristly hairs on outer side of hind tibiæ; tarsi brownish yellow, tips black.

*Wings*.—Anterior half rather dark brown, the colour gradually fading away posteriorly to the pale brown hind border. Mediastinal cell, nearly to its tip, darker brown, no separate stigma. Upper fork of fourth longitudinal vein issues as two separate veins from the discal cell, the outer side of which thus contains a distinct angle. Halteres pale yellow, knobs black.

*Described* from one ♂ in the Indian Museum collection from Margherita (slightly damaged, but with the specific characters sufficiently distinct).

**C. segmentatus**, mihi, sp. nov.

(Plate xii, fig. 11, abdomen; 12, wing.)

♂. Nepal. Long. 10 mm.

*Head*.—Vertex jet-black, prominent; ocelli small, equidistant, whitish. Eyes very large, occupying practically the whole of the head, lower facets much smaller than upper ones. Whole of face grey dusted. Antennæ tawny. Proboscis large, shining brown, lower part grey dusted; palpi dark brown with some hair. Back of head grey dusted, studded with black hairs.

*Thorax*.—Dorsum and sides dark blackish brown. Two narrow, longitudinal, yellowish grey stripes on dorsum, dividing the surface into three equal parts, and a silvery grey reflection on the sides, behind the wings (seen from behind). Humeral calli light yellowish brown.

*Abdomen*.—Shining black, the segments well separated, with a telescopic appearance. Posterior border of first segment shining steel-blue-grey; second wholly black; rest of segments, seen in certain lights, steely ænous, highly shining, with a dull jet-black moderately wide posterior border.

The whole abdomen moderately thickly clothed with soft black hairs.

*Legs*.—Blackish brown; base of hind femora, tips of four anterior femora, and the anterior tibiæ wholly, pale tawny brown.

*Wings*.—Pale grey; stigma brown but ill-defined, elongated and spread over both mediastinal and sub-costal cells, and from this stigmatic spot, a brownish grey band proceeds posteriorly, rapidly narrowing, and disappears on reaching the outer cross-vein, thus forming what at a short distance appears to be a brown triangular cloud, darkest in front. The lower branch of the upper fork of the fourth longitudinal vein issues from below the middle of the outer side of the discal cell which latter has the appearance of having the upper outer corner cut off by the upper branch.

*Described* from one ♂ in perfect condition in the Indian Museum collection from Gowchar (Nepal). A very distinct and handsome species.

*N.B.*—Prof. Bezzi's new species (*sauteri*, ♂ ♀) from Formosa, Takao, 15-iv and 11-v-07, falls next to *segmentatus* in my table, but is of quite a different type to all the other species herein mentioned, belonging to the *aureus*, Mg., group of European species, to which group I can refer no species from a truly Oriental locality. Probably Formosa, and the whole of China also, belongs to the Palæarctic Region.

### **C. frater, mihi, sp. nov.**

(? ♀, *Leptis punctum*, Big., *nom. nud. in litt.*)

♂. Tenasserim. Long. 10-11 mm.

*Head*.—Vertex and frons black; antennæ brownish tawny, proboscis and palpi tawny; face below antennæ grey; lower facets of eyes slightly smaller than upper ones. Back of head greyish, with white hair behind the eyes, but absent behind the vertex.

*Thorax*.—Light tawny brown, nearly bare; lower portion at the sides nearly livid. Scutellum concolorous, with traces of being covered with short hairs.

*Abdomen*.—Light tawny brown with yellowish grey pubescence, and some black hairs intermixed. Posterior borders of segments narrowly black, the colour being rather broader on the last segments. Black hairs adorn the borders of the segments and the tip of the abdomen. Belly similarly marked.

*Legs*.—Tawny; coxæ with some gold-yellow hair in front; tibiæ mouse-colour, becoming dark brown towards tips; tarsi dark brown.

*Wings*.—Yellowish grey; apical portion from just before the end of discal cell rather grey, this colour extending slightly along the posterior border. The veinlets of upper fork of the fourth longitudinal vein issue contiguously from extreme corner of discal cell, the outer side of which is quite straight. Stigma dark brown, oval, distinct. Costal cell yellowish. Halteres yellow, knobs brown.

*Described* from two examples in fair condition from Tenasserim, in the Indian Museum collection.

*N.B.*—In general appearance considerably like *ferruginosa*, Wied.

A ♀ in the above collection may be the other sex of this species; it is labelled *Leptis punctum*, Big., which is probably only a *nomen nudum*.

**C. unicolor**, mihi, sp. nov.

(Plate xii, fig. 13, wing.)

♂. Assam. Long. 5 mm.

*Head.*—Vertex very small, raised, dark brown, ocelli shining, brownish white, semi-transparent. Face grey dusted; antennæ, proboscis and palpi bright tawny brown. Upper two-thirds of eyes rich brown, with large facets; lower third black, with very much smaller facets.

*Thorax.*—Dorsum, sides and scutellum bright tawny brown, with scattered gold-yellow hairs, and with black hairs on the scutellum.

*Abdomen.*—Concolorous; bases of segments (except first and second) narrowly brown; the whole abdomen covered irregularly with black hairs, including a row on the posterior border of every segment. Belly concolorous, with black hairs.

*Legs.*—(Fore pair, except coxæ, missing.) Uniformly bright tawny brown; tarsi darker brown. Legs practically bare.

*Wings.*—Pale grey, almost clear. Stigma distinct, but with ill-defined edges. A very light brownish band extending from it posteriorly, partly across the wing. Veins tawny brown. Halteres tawny.

*Described* from one ♂ in good condition in the Indian Museum collection, from Margherita.

**C. stigma**, mihi, sp. nov.

(Plate xii, fig. 14, wing.)

♂. Lower Burma. Long. hardly 6 mm.

*Head.*—Vertex reduced to a very small elevated black triangle on the angles of which are the three prominent ocelli. Eyes dark reddish brown, contiguous for a considerable distance, the facets much larger for a considerable space in front above the antennæ, and with a greenish black tinge and (in certain lights) a narrow bright green horizontal stripe across the middle. Face much withdrawn between the eyes; light grey above and below antennæ. Antennæ yellow, third joint blackish with some hairs and a rather long arista, which is microscopically pubescent. Proboscis cinereous grey, lower part tawny yellow; the palpi tawny yellow with tips broadly black and hairy. A fringe of light hairs around the eyes, back of head light grey.

*Thorax.*—Greenish with a dorsal narrow brown stripe in front and two small indistinct brown spots in middle of dorsum. Sparse

yellow hairs over the whole dorsum. Sides of thorax cinereous grey, yellowish at base of wing. Scutellum grey; centre with a slight greenish tinge.

*Abdomen*.—Yellowish, first segments blackish grey, segments 2, 3 and 4 with a blackish, rather wide posterior border and dorsal stripe, remainder of segments blackish. Belly yellow, tip blackish. A few yellow hairs scattered over dorsum of abdomen; black hairs at tip. Genitalia bi-lobed, tawny yellow, with stiff black hairs.

*Legs*.—Coxæ and femora pale yellow, with a few yellow hairs near the tip, on under side of latter, and with generally distributed microscopic black hairs. Tibiæ blackish yellow, with microscopic black hairs and some stronger bristles; tarsi similar, tips black. Middle tarsi with two long spines at tip.

*Wings*.—Quite clear, stigma distinct, dark brown but without well-defined limits, traces of a pale yellowish stripe towards tip of wing. Inner cross-vein placed before one-fifth of the discal cell; anal cell closed well before wing-border. Halteres yellow, knobs black.

*Described* from a single perfect ♂ in the Indian Museum collection, taken by Dr. Annandale, 2-iii-08, at the base of the Dawna Hills, Lower Burma.

*N.B.*—I have observed a character in the wings which may, if constant, assist in determining the species.

The upper branch of the fourth longitudinal vein, forming the upper side of the discal cell, forks in some species absolutely on the extreme outer corner of that cell, the two veinlets springing simultaneously, the outer side of the discal cell being practically quite straight. In this group I find (1) my new species *frater*; (2) a specimen in the Indian Museum collection labelled "*Leptis pallidus*, Bigot, sp. nov.," but which agrees with Schiner's "*insularis*" except for the black third antennal joint and the absence of white spots above the antennæ; and (3) a ♀ in the above collection which would be *ferruginosa*, Wied., except for the long thin palpi, and for this venation, and which specimen I now regard as the probable ♀ of my *frater*, but which bears a label "*Leptis punctum*, Bigot, sp. nov."

A second group is formed by those species in which the veinlets do not spring simultaneously from the corner of the discal cell, but distinctly separately, the lower one sometimes from the middle of the outer side of the discal cell, which side thus always contains an angle. In (1) *marmoratus*, mihi, and (2) *luctuosus*, mihi, the veins start close together yet quite distinctly apart; in (3) *ferruginosa*, Wied., (4) *correcta*, Os. Sac., (5) *albopictus*, mihi, and (6) *unicolor*, mihi, the lower veinlet emerges from distinctly above the middle of the outer side of the discal cell, whereas in the seventh and last species, *simplex*, Meij., this veinlet emerges barely above the middle.

In group 3 is one species only,—*segmentatus*, mihi,—in which the veinlets separate so early as to appear as if the upper one had cut off the upper corner of the discal cell.

These distinctions may appear trivial, and, of course, may not be consistent. In the plate, my first group is unrepresented, but it may be easily recognised. The wing of my *marmoratus* illustrates the first division of my second group, the wing of my *albo-pictus* illustrates the second division of the second group, and Meijere's figure of his *simplex* (Bijd. Dierk., xviii, pl. viii, fig. 15), the third division of the second group. My third group contains only my *segmentatus*. I conclude this paper by a revised catalogue.

## LEPTIDÆ.

### SURAGINA, Wlk., 1860.

Proc. Linn. So. Lond., iv, 110.

1. *illucens*, Wlk., 1860, loc. cit., 110, ♀ .. Celebes.
2. *signipennis*, Wlk., 1862, loc. cit., vi, 8, ♀ Gilolo.

### ATHERIX, Meig., 1803.

Illig. Mag., ii, 271.

1. *nigritarsis*, Dol., 1858, Nat. Tijds. Ned. Ind., xvii, 92 .. .. Amboina.
2. *limbata*, Os. Sac., 1882, Berl. Ent. Zeits., xxvi, 100, ♀ .. .. Philippines.  
— ? *Var.*, pl. xii, fig. 4 (wing).
3. *labiata*, Big., 1887, Bull. So. Ent. Fr. xii, 117.. .. Ceylon.
4. *calopa*, Brun., sp. nov., ♂, pl. xii, fig. 2 (abdomen) .. .. Tenasserim.  
(*Atherix calopus*, Big., *nom. nud.*)
5. *lanopyga*, Brun., sp. nov., ♀, pl. xii, fig. 3 (full ins.) .. .. Assam.  
(*Chrysopila id.*, Big., *nom. nud.*)
6. *cincta*, Brun., sp. nov., ♀, pl. xii, fig. 1 (wing) .. .. *Id.*
7. *metatarsalis*, Brun., sp. nov., ♂, pl. xii, figs. 5 (wing) and 6 (hind leg) .. .. Lower Burma.

### LEPTIS, Fab., 1805.

Syst. Antl., 69.

1. *uniguttata*, Os. Sac., 1880, Ann. Mus. Gen., xvi, 422, ♂ .. Sumatra.
2. *apicipennis*, Brun., sp. nov., ♀, pl. xii, fig. 7 (wing) .. .. Assam.

**MACELLOPALPUS**, Big., 1886.

Bull. So. Ent. Fr. (1886), xlvi.

( ? Syn. *Leptipalpus*, Rond.)

1. **flaveolus**, Big., 1886, loc. cit., ♀ .. Papua.
2. **fulvidus**, Brun., sp. nov., ♀, pl. xii,  
fig. 8 (head, profile) .. Assam.  
(*Id. id.*, Big., *nom. nud.*)

**LEPTIPALPUS**, Rond., 1850.

Nuov. Ann. v. sci. nat., Bologna, ii, 183.

( ? *Heliomyia*, Dol.)( ? *Macellopalpus*, Big.)

1. ( ? ) **waigiensis**, Big., 1887, Bull. So. Zool.  
Fr., xii, 108, ♀ .. Waigöe.

**CHRYSOPILUS**, Mcq., 1826.

Rec. Trav. Soc. Sci. Lille, p. 82.

1. **decisus**, Wlk., 1857, Proc. Linn. So.  
Lond., i, 15, ♂ (*Leptis decisus*) .. Malacca.
2. **maculipennis**, Wlk., 1857, loc. cit., i,  
118, ♂ ♀ (*Chrysopila id.*) .. Borneo.
3. **vacillans**, Wlk., 1859, loc. cit., iii, 89,  
♂ ♀ .. Aru Island,  
Papua.

N.B.—*Vide* Os. Sac., Ann. Mus. Gen., xvi, 420, notes.

4. **impar**, Wlk., 1861, loc. cit., v, 282, ♀  
(*Leptis*) .. Batjan.
5. **guttipennis**, Wlk., 1861, loc. cit., v, 282,  
♀ (*Chrysopila*) .. *Id.*
6. **stylatus**, Wlk., 1864, loc. cit., vii, 208,  
♀ (*C. stylata*) .. Mysol.
7. **insularis**, Sch., 1868, Dipt. Novara  
Reise, 199, ♀ .. Nicobar Isles.
8. **correctus**, Os. Sac., 1882, Berl. Ent.  
Zeits., xxvi, 101, ♀, fig. 2 (wing)  
(*correcta*) .. Philippines.
9. **simplex**, Meijere, 1904, Bijd. Dierk.,  
xviii, 97, ♂ .. Java.
10. **sauteri**, Bezzi, 1907, Ann. Mus. Hung.,  
v, 564, ♂ ♀ .. Formosa.
11. **albopictus**, Brun., sp. nov., ♀, pl. xii,  
fig. 9 (wing) .. Assam.  
(*Leptis albopicta*, Big., *nom. nud.*)

12. **marmoratus**, Brun., sp. nov., ♂, **pl.**  
**xii**, fig. 10 (wing) .. Assam.  
 (*Leptis marmorata*, Big., *nom. nud.*)
13. **luctuosus**, Brun., sp. nov., ♂ .. *Id.*  
 (*Atherix id.*, Big., *nom. nud.*)
14. **segmentatus**, Brun., sp. nov., ♂, **pl.**  
**xii**, fig. 11 (abd.); 12 (wing) Nepal.
15. **frater**, Brun., sp. nov., ♂ .. Tenasserim.  
 (♀ ? *Leptis punctum*, Big., *nom. nud.*)
16. **unicolor**, Brun., sp. nov., ♂, **pl. xii**,  
 fig. 13 (wing) .. Assam.
17. **stigma**, Brun., sp. nov., ♂; **pl. xii**, fig.  
 14 (wing) .. Lower Burma.

*N.B.*—The above are most certainly true species of *Chrysopilus*. I am indebted to Mr. C. O. Waterhouse for the examination of Walker's types, thus enabling me to definitely place them in this genus.

18. **ferruginosus**, Wied. (? 1823), Zool.  
 Mag., iii, 4 (*Leptis id.*) .. Java, Borneo,  
 Celebes, Ternate.

(*Heliomyia ferruginea*, Dol., Nat. Tijd.  
 Ned. Ind., xiv, 402, pl. vii,  
 fig. 5.)

*N.B.*—This species may require the erection of a new genus and may be congeneric with *lupinus*, O. S. *Vide* note under *Maccellopalpus fulvidus*.

19. **lupinus**, Os. Sac., 1880, Ann. Mus.  
 Gen., xvi, 420, ♀ (*lupina*) .. Sumatra.



XLIV. REVISED AND ANNOTATED CATALOGUE OF ORIENTAL BOMBYLIDÆ WITH DESCRIPTIONS OF NEW SPECIES.

By E. BRUNETTI.

The object of the present paper is mainly to revise the species of the sub-family *Anthracinæ*, by placing them in their correct genera, and to describe a number of new ones which are to be found either in the Indian Museum, the Pusa collection, or my own. These new species all appear very distinct from all previously described, otherwise I would not have ventured to establish them. To these descriptions I have ventured to add some redescriptions of a few species of the older authors (mainly Walker's), which, on account of their brevity, are not easily recognisable.

As regards the disposition of the species in the various genera, Van der Wulp's Catalogue gave twenty-one and forty-six species respectively, under *Exoprosopa* and *Anthrax*, besides six under *Argyramæba*, thus ignoring the genus *Hyperalonia* altogether. To my surprise I find this latter genus also ignored in the new Palæartic Catalogue, for *tantalus*, F., a true *Hyperalonia*, is placed under *Exoprosopa*. It is certainly a valid genus, as admitted and re-characterised by Osten Sacken in the *Biologia Cent. Amer.* (i, 78), and Prof. Bezzi admits it in his recent notes on this group (*Zeits. Hym. u. Dipt.*, 1908, pt. i, p. 26). In the present paper I have included under this genus all those species with four submarginal cells, having had no means of testing them on the other characters proposed by Osten Sacken; still, this character in itself is of generic rank.

Of Van der Wulp's twenty-one species of *Exoprosopa*, thirteen belong to *Hyperalonia*, and of the remainder, two (*binotata*, Mcq., and *cæruleopennis*, Dol.) are synonymous; the former with *Exoprosopa collaris*, W., and the latter with *Hyperalonia tantalus*, F.

Of Van der Wulp's forty-six species of *Anthrax*, I refer six to *Hyperalonia*, and seven each to *Exoprosopa* and *Argyramæba*, leaving seventeen as approved species of the genus (*sensu stricto*); two additional ones being synonymous (*carbonaria*, Wlk. = *Argyramæba bipunctata*, F., and *trimaculata*, Wulp = *Argyramæba distigma*, W., var.). Of the residuum of seven species, I refer in a special note to one (*emarginata*, Macq.), leaving six of which it has been impossible to obtain sufficient information to place them generically.

Van der Wulp's four species of *Argyramæba* remain in that genus.

My thanks are due, and are hereby tendered to Mr. E. E. Austen of the British Museum, through whose kindness in examining the

types in that Institution, I am enabled to place in their correct genera a number of Walker's species, these species being noted under each genus in question.

In the case of two species (*aperta*, Wlk., and *manifesta*, Wlk.) which have been compared by Mr. F. M. Howlett with the British Museum types, I have, as the specimens appear to agree well with the descriptions, accepted the identifications.

After obtaining a more or less reliable generic classification, the much more difficult problem of separating the species had to be encountered, and it is to be regretted that, so far as this paper is concerned, the carrying out of this task has been chiefly comparative, analytical tables of the species being obviously impossible without a more precise acquaintance with a larger proportion of the species; Walker's species being known to me almost wholly from descriptions only. Therefore, as hereinafter stated, my provisional "grouping" of species in the genera *Hyperalonia*, *Exoprosopa* and *Anthrax* must be received with a certain amount of caution, and it must be understood that they are not intended to represent natural affinities, being based almost entirely on wing-markings. The reason of this is, that this character is, in cabinet specimens (which are generally more or less damaged, when of questionable antiquity), the *most lasting one*, being the least affected by time, dust, mould, etc. Also it is the only character mentioned by *every* author. Concerning the geographical limits of this catalogue, the only dubious point is the inclusion of a few species described from China. If these latter are from South China, they may be regarded as belonging to the Oriental Fauna, but if proved to occur in North China only, they must be eliminated from this list and relegated to the Palæarctic Catalogue.

*N.B.*—The descriptions and redescriptions are placed all together at the conclusion of the catalogue, and after these I have given a supplementary list of those species which are known on the confines of the Oriental Region (Turkestan, Persia, Arabia, and Queensland). Any of these species might easily be met with in the Oriental Region, whilst any of the Palæarctic species may occur in the Himalayas; a list of these latter can be found in the recent Palæarctic Catalogue. I also add a list, probably not so complete as it might be, of Bombylidæ, which have been described from unknown localities, as some of these may prove to be Oriental.

#### Sub-Family *ANTHRACINÆ*.

#### **HYPERALONIA**, Rond., 1864.

Archiv. per la Zool. Modena, iii, 1.

HYPERALONIA (revised generic characters), Os. Sac., Biol. Cent. Am., i, 89.

1. *tantalus*, F., 1794, Ent. Sys., iv, 260 (*Anthrax*).

*Anthrax id.*, Wied., Auss. Zweil., i, 255.

*Id. id.*, Macq.; Dip., i, 401.

*Exoprosopa id.*, Macq., Dip. Ex., ii, 1, 37 (315), ♂ ♀.

*Id. id.*, Kat. Pal. Dip., ii, 169.

*Hyperalonia id.*, Rond., Ann. Mus. Gen., vii, 453.

*Anthrax cæruleopennis*, Dol., Nat. Tijd. Ned. Ind., xiv, 400, pl. ix, 2.

*Hyperalonia hyx*, Bigot, *nom. nud.* (Ind. Mus. Coll. syn., t. m.).

Type in Wiedemann's collection.

Loc.—Tranquebar, Java [t. *Wied.*]; India, China, Berlinhafen (Papua) [all t. *Wulp*]; Borneo [t. *Rond.*]; Celebes [t. *Os. Sac.*]; Semarang (Java) in August [t. *Meijere*]; Sikhim; Nepal (Katmandu, Soondrijal); Assam (Sadiya, Sibsagar); Tenasserim [all ♀ ♀ in *Ind. Mus. Coll.*, t. m.]; Sumatra [*Coll. mihi*]. The Palæarctic Catalogue records it from Japan, under *Exoprosopa*.

2. **chrysolampis**, Jaen., Neue Ex. Dip., 36, pl. i, fig. 8 (*Exoprosopa id.*).

Type in Frankfurt Museum.

Loc.—Java [t. *Jaen.*, *Os. Sac.*]; Moluccas [t. *Wulp*]; Sikhim; W. Himalayas (Bhim Tal, 4,500 ft.), 22—27-ix-06 [*Annan-dale*] [all in *Ind. Mus. Coll.*, t. m.]; Borneo (Kina Balu) [*Coll. mihi*].

N.B.—These two species are very closely allied, Jaennicke's "1st joint of antenna red" applying to only two out of the eight specimens of this species that I have seen. A constant distinctive character is the colour of the hair at the base of the belly, which I found quite white in seven specimens of *tantalus*, and distinctly yellow in eight specimens of *chrysolampis*.

3. **purpuraria**, Wlk., 1852, Ins. Saund., pt. 3, 169, ♀ (*Anthrax id.*).

Loc.—Walker gives Java, but Van der Wulp gives only East India.

4. **confirmata**, Wlk., 1861, Pr. Linn. So. Lond., v, 283, ♂ (*Anthrax id.*).

Loc.—Batjan.

5. **demonstrans**, Wlk., 1860, loc. cit., iv, 112, ♀ (*Anthrax id.*)

Loc.—Macassar (Celebes).

6. **fuscipennis**, Mcq., 1850, Dip. Ex. Supp. 3, 33 (193), ♀, pl. iii, 9 (*Exoprosopa id.*), wing.

Loc.—Java.

7. **tristis**, Wulp, 1868, Tijd. Ent., xi, 107, ♂, pl. iii, 11, wing (*Exoprosopa*).

Loc.—Timor; Tenmalai (S. Ind.), 22-xi-08, at light [*Annan-dale*].

N.B.—A black-winged species, with the tip quite clear. Very distinct.

8. **dives**, Wlk., 1849, List Dip. Brit. Mus., ii, 240, ♂.

Loc.—Sylhet. Type in British Museum.

*N.B.*—Wings dark brown at the base, and along the fore border till near the tip, outline of colour regular and nearly parallel to hind border.

9. **sphinx**, F., 1787, Mant. Ins., ii, 329 (*Bibio*).  
 Fab., Syst. Antl., 126 (*Anthrax*).  
 Wied., Auss. Zwei., i, 258 (*Anthrax*).  
 Macq., Dip. Ex., ii, 1, 37 (315), ♀.

Loc.—East India; West India and Ceylon; Trivandrum (S. Ind.), 13-xi-08 [*Annandale*]. Type in Fabricius's collection.

*N.B.*—I possess three specimens from Ceylon of what I have identified as this species, of which two were taken by me at Colombo 1-vii-04. The Pusa collection contains one from Bulsar (Bombay Presid.), 20-v-04, and one from the neighbourhood of Bombay, 21-iii-05, the latter taken on seaweed.

10. **albicincta**, Macq., 1840, Dip. Ex., ii, 1, 38, ♀, pl. xvi,  
 7, wing (*Exoprosopa*).  
*Exoprosopa id.*, Sch. Reise Novara, 118.

Loc.—Shanghai [t. Sch.]. Type, in Paris Museum, from an unknown locality.

11. **latifascia**, Wlk., 1860, Tr. Ent. So. Lond. (2nd series),  
 iv, 142 (*Anthrax*).

Loc.—China.

12. **combinata**, Wlk., 1860, loc. cit., 143 (*Anthrax*).  
 Loc.—China.

13. **aurantiaca**, Guérin, 1843 (?), Icon. du regne anim., iii  
 (Insectes), 539, pl. xcv, 6, a, b, c (*Anthrax*).

Loc.—Bengal.

*N.B.*—In two specimens undoubtedly of this species in the Pusa collection (also from Bengal) the black dorsal abdominal line is uninterrupted, and the wings are nearly uniformly tinged with brown; whereas Guérin's figure shows the former interrupted, and the dark part of the wings clearly defined and confined to the anterior half. As this author's description is short and not easily accessible I have redescribed the species at the end of this catalogue.

14. **suffusipennis**, mihi, sp. nov., ♀.

Plate xii, fig. 15 (wing).

Loc.—India (Purneah Dist.). Type in Indian Museum.

15. **satyrus**, F., 1775, Sys. Ent., 758 (*Bibio*).

*Anthrax satyrus*, F., Ent. Syst., iv, 259.

*Id. id.*, Wied., Auss. Zwei., i, 322.

*Exoprosopa id.*, Wulp, Tijds. Ent., xi, 106, ♂ ♀,  
 pl. iii, 10 (full insect, coloured).

Loc.—Aru Island. Wiedemann repeats Fabricius's localities of New Holland and China.

16. **devecta**, Wlk., 1861, Pr. Linn. So. Lond., v, 148, ♀ (*Anthrax id.*).

Loc.—Amboina [t. Wlk.]; Key Ins. [Coll. *mihi*].

N.B.—At the end of the catalogue will be found notes on the differences between this species and *doryca*, Boisd. From a comparison of my named specimen of this species with Van der Wulp's description and plate of *satyrus*, F., the two appear very closely allied, and I should not be surprised if they prove identical.

17. **doryca**, Boisd., 1835, Voy. de l'Astrol. Zool., ii, 665, pl. xii, 12 (*Anthrax*).

Wulp, Notes Leyd. Mus., vii, 81 (*Exoprosopa*).

Os. Sac., Ann. Mus. Gen., xvi, 433 (*Exoprosopa*).

*Anthrax ventrimacula*, Dol., Nat. Tijd. Ned. Ind., xiv, 399, pl. ix, 1, ♀.

*A. pelops*, Wlk., Pr. Linn. So. Lond., iii, 90, ♂.

*Exoprosopa audouini*, Macq., Dip. Ex., ii, 1, 36, ♂, pl. xvi, 1 (full insect and head in profile).

*E. leuconæ*, Jaen., Neue Ex. Dip., 37.

Loc.—Amboina [t. Dol., Wulp, Os. Sac.]; Papua (Mansinam, xi, 1871) and Gilolo [t. Os. Sac.]; Timor [t. Wulp]; Waigøe, Aru [t. Wlk.]; Moluccas [t. Jaen.]; Key Ins. [Coll. *mihi*].

N.B.—The single example I have seen of this species agrees exactly with Doleschall's plate (*ventrimacula*, v. *supra*). It is quite distinct from the two following species by the brown colour of the wing being very narrow along the costa, leaving most of the marginal cell clear, whilst a brown streak extends along the 3rd longitudinal vein, thinly filling the upper basal cell and leaving the discal cell wholly clear. Doleschall says it is 6 lines in length; my specimen is 16 mm., but most of the species vary considerably in size. I have accepted the synonymy as given by Van der Wulp, which seems to prove it a very variable species, as Walker's two descriptions of his "*pelops*" (♂ and ♀), Jaennicke's *leuconæ*, and Macquart's plate of his *audouini* show important points of difference. It therefore appears advisable to append a description of the specimen I possess, named (by what authority, I have no means of knowing) as *doryca*. As noted by Osten Sacken, this species and the two next are closely allied, but I think the brown colour in the wing not encroaching to the slightest extent on the discal cell, will separate *doryca* from the other two, whilst they may be divided by the yellow-haired belly in *flaviventris*, and the white-haired one in *ænomaus*.

I append at the end of the catalogue a redescription of this species.

18. **flaviventris**, Dol., 1857, Nat. Tijd. Ned. Ind., xiv, 400 (*Anthrax*).

Loc.—Amboina [t. Dol.]; Lower Burma, Tenasserim [*Ind. Mus. Coll.*, t. m.]; Trivandrum (S. India).

*N.B.*—With this species I have identified almost with certainty three ♀♀ in the Indian Museum (two from Tenasserim and one from Mergui in Lower Burma).

The under side of the abdomen is nearly wholly yellow-haired, as described by Doleschall, but the brown colour of the wing crosses the upper basal part of the discal cell, whereas Osten Sacken (Berl. Ent. Zeits., xxvi, 112) says it should not encroach upon it.

19. *ænomaus*, Rond., 1875, Ann. Mus. Gen., vii, 453.

Loc.—Borneo (Sarawak) [t. *Rond.*]; Philippines [t. *Os. Sack.*]. Type in Genoa Museum.

*N.B.*—In the Indian Museum are three specimens which appear to be this species (from Sikhim and Mergui), varying in size from 9 to 17 millimetres, Rondani's measurements being 18 mm. Both Rondani and Osten Sacken say, belly with "yellowish white" and "yellow" pile, respectively, but in the above examples it is only whitish; moreover, the 2nd posterior cell is no narrower at the distal than the proximal end (but is contracted in the middle, as occurs in several species); and finally, the white spots at the tip of the abdomen are four in number, and do not resemble cross-bands. I still believe they are this species.

An undescribed "sp. nov." of Bigot's in the Indian Museum (*argyura*: the "type" is headless and in bad condition, but there are two other specimens, evidently of the same species, one of which possesses a head) closely resembles *ænomaus* and may represent the true form. In this the silvery white pile on the abdomen tip is very brilliant, and takes the form of a broad spot, extending over all the last three segments.

The pile on the belly is white, the 2nd posterior cell of uniform width, and the brown band on the wing is rather more restricted and more clearly defined than in the specimens I have identified as *ænomaus*.

20. *obliqua*, Macq., 1840, Dip. Ex., ii, 1, 37 (315), ♀, pl xvi, 8 (*Exoprosopa*).

Loc.—Timor. Type (♀) in Paris Museum.

#### *Notes on the genus* **HYPERALONIA**.

It is quite impossible to separate, in any brief manner, the above twenty species into groups, yet I fully believe they are all or nearly all good species. On Mr. Austen's information that they possess four submarginal cells I have included under this genus the following species of Walker: "*Anthrax*" *confirmata*, *combinata*, *devector*, *demonstrans* and *latifascia*. Of *devector* I have since found a named example in my own collection.

The wing-marks appear to me to be reliable characters, as they have been found constant in specimens of the same species examined by me. The following species have been seen by me either in the Indian Museum collection or my own: *tantalus*, F.,

*chrysolampis*, Jaen., *devector*, Wlk., *doryca*, Boisd., *sphinx*, F., *aurantiaca*, Guér., *flaviventris*, Dol., and *ænomaus*, Rond., to which I add a new one quite distinct from all by the diffused spots on its wing, viz., *suffusipennis*.

Of the remainder, wing figures have been available of *fuscipennis*, Macq., *tristis*, Wulp., *albicincta*, Macq., *satyrus*, F., and *obliqua*, Macq., and of these, *tristis* and *obliqua* are quite distinct from all others; *devector*, Wlk., and *satyrus*, F., seem to me to be allied.

Without considering the arrangement to in any way represent natural affinities, I have, in my own mind, merely as a temporary convenience, grouped the species as follows, after much difficulty: (1) species with wings mainly dark brown or blackish, with more or less purplish reflections (*tantalus* to *fuscipennis* incl.); (2) species with wings mainly very dark but with a limited clear tip (*tristis*) or posterior margin (*dives*); (3) an intermediate species with uniformly brown wings but not of such intensity as in the first group (*sphinx*); (4) species with the wings never clear, but with the anterior half (more or less) always much darker, without any distinct line of demarcation between the dark and light portions (*albicincta* to *suffusipennis*); (5) species with grey or light brown wings with darker parts and with the costa and principal veins streaked with yellow (*satyrus* and *devector*); (6) an intermediate species with mainly clear wings and a distinct narrow dark anterior margin (*doryca*); (7) species with a nearly or quite clear wing bearing the oblique dark baso-costal band which is so common in this sub-family (*flaviventris* and *ænomaus*); and, finally, (8) an isolated species with clear wings and an oblique bilobed band (*obliqua*). Students must remember that this is merely an artificial and temporary sequence pending the better study of the affinities and limits of all the species.

## EXOPROSOPA, Macq., 1840.

Dip. Ex., ii, 1, 35.

### 1. *pennipes*, Wied., 1821, Dip. Ex., 1, 129 (*Anthrax*).

Wied., Auss. Zwei., i, 272 (*Anthrax*); Macq.,  
Dip. Ex., ii, 1, 49 (*Exoprosopa*); Rond., Ann.  
Mus. Gen., vii, 452 (*Hyperalonia*).

Loc.—Borneo [t. Rond.]; Karachi (India) and Assam [*Ind. Mus. Coll.*, t. m.]; Pusa (Bengal), on pear tree, 5-v-1906 [*Pusa Coll.*, t. m.].

Type in Westermann's collection.

N.B.—This species is easily known from all others in the genus by the dense black hair on the hind tibiae.

### 2. *lar*, F., 1781, Sp. Ins., ii, 414 (*Bibio*).

F., Sys. Antl., 110; Wied., Auss. Zwei., i, 268  
(*Anthrax*).

Loc.—Bengal [t. *auct.*]; Belgatchia (Calcutta), August 1906; Bombay Presid., 21-iii-1905, on seaweeds [*Pusa Coll.*, t. *m.*]. Types in the Fabricius collection.

3. **latipennis**, mihi, sp. nov., ♀.

Loc.—Assam (Shillong). Type in Indian Museum.

*N.B.*—These three species can be separated from the others in this genus by the practically wholly black or blackish brown wings. In my species they are wholly black, whereas in *pennipes* the extreme tip is clear, whilst in *lar* the distal portion of the posterior border is rather narrowly clear.

4. **flavipennis**, mihi, sp. nov., ♀.

Loc.—Bengal (Pusa), 19-iv-1907 [*Pusa Coll.*, type], and Pusa, 25-v-1906 [*Ind. Mus. Coll.*, co-type].

*N.B.*—Easily recognised from all other species by the closed 1st posterior cell, in conjunction with the bright yellow wings.

5. **flammea**, mihi, sp. nov., ♀.

Loc.—Bengal (Pusa) [type, Pusa, 17-iv-1907, *Pusa Coll.*], Trivandrum (S. Ind.) [*Ind. Mus.*].

*N.B.*—This is the only other species except *insulata*, Wlk., with closed 1st posterior cell: it has clear wings with two brown bands.

6. **collaris**, Wied., 1828, Auss. Zwei., i, 271 (*Anthrax*).

*Anthrax ruficollis*, Saund., Tr. Ent. So. Lond. (1841), iii, 59, pl. v, 5 (full insect ♀, coloured).

*Anthrax collaris*, Wlk., List Dip. Brit. Mus., ii, 247, ♀.

*Exoprosopa binotata*, Mcq., Dip. Ex. Supp., 5, 89, ♂.

Loc.—Madras [t. *Walker*]; Central India [t. *Saunders*]; India [t. *Macq.*]; Bangalore, Trivandrum (both South India), Sahibganj (Bengal) [*Ind. Mus. Coll.*, t. *m.*].

**Plate xii**, fig. 16 (wing). Type in Vienna Museum.

*N.B.*—I have practically no doubt whatever as to the synonymy given here, and the fact that Wiedemann's type came "probably" from the Cape is not sufficient to discard the identity. Saunders, in describing his *ruficollis*, gives an excellent coloured plate which is unmistakeable, and refers to its affinity to the older author's species, though fearing the descriptions of the wing did not quite agree with his specimen. Wiedemann's description, however, appears exact enough; his "guttula" referring to the very small sub-hyaline spot in the 2nd basal cell, adjoining the very base of the discal cell; and this spot is referred to by Macquart, in his *binotata*, as follows, "un point à la base de la cellule discoidale."

Wiedemann's "excisura, apiceque limpidis" is, of course, correct, and Macquart's description also applies. Moreover I am assured of the identity of this latter author's *binotata* by his mention



of the small tuft of white hair on or just below the posterior corners of the thorax.

The three specimens (♀ ♀) in the Indian Museum collection agree well with all the descriptions; the small subhyaline spot in the 2nd basal cell is not always very clear, and the white tufts of hair referred to are only visible in one specimen, whilst the conspicuous, round white hairy spots on the 3rd abdominal segment are easily effaced. The specimens, however, are absolutely uniform in the wing markings, and there is no doubt whatever of their identity with Wiedemann's species, although one of them bears a label in Bigot's handwriting "Exop. bipunctata Macq." It is evidently an error for "*binotata*, Mcq.," as I cannot trace that Macquart ever recorded a species as "*bipunctata*."

7. *lateralis*, mihi, sp. nov., ♀.

Plate xii, fig. 17 (wing).

Loc.—Calcutta. [Type *Ind. Mus. Coll.*]

8. *bengalensis*, Macq., 1840, Dip. Ex., ii, 1, 49 (327), ♀, pl. xviii, 4 (wing).

Loc.—Bengal. Type (♀) in Paris Museum.

Plate xii, fig. 18 (wing).

N.B.—A good series of this species (but in very indifferent condition) in the Indian Museum collection shows that there is a great tendency to appendiculation, and the presence of additional veinlets in the wings, this feature sometimes appearing in one wing only. The species is at once recognisable from Macquart's plate, and seems rather a consistent one in other characters, and in size.

9. *javana*, Macq., 1840, Dip. Ex., ii, 1, 49 (327), ♀, pl. xviii, 6 (wing).

Loc.—Java. Type (♀) in Paris Museum.

10. *retrorsa*, mihi, sp. nov., ♀.

Loc.—Persia (Bushire). [Type, *Ind. Mus. Coll.*]

Plate xii, fig. 19 (wing).

11. *annandalei*, mihi, sp. nov.

Plate xii, fig. 20 (wing).

Loc.—Lower Burma (Moulmein, 6-iii-1908). [Type, *Ind. Mus. Coll.*]

12. *alexon*, Wlk., 1849, List Dip. Brit. Mus., ii, 246 (*Anthrax*), no sex given.

Loc.—East Indies. Type in British Museum.

N.B.—Van der Wulp's catalogue gives East India both for this and the next species, which is incorrect, Walker's locality being East Indies, which is quite different. He does not mention the sex.

13. *auriplena*, Wlk., 1852, Ins. Saund., pt. 3, 171, ♀ (*Anthrax*).

Loc.—East Indies.

14. *insulata*, Wlk., 1852, loc. cit., 172, ♀ (*Anthrax*).  
*octonotata*, Big., *nom nud.* (Ind. Mus. Coll.).

Loc.—East Indies [t. *Walker*]; Nepal, various localities [*Ind. Mus. Coll. t. m.*]; Mussoorie [*Pusa Coll.*].

**Plate xii**, fig. 21 (wing).

*N.B.*—This is essentially a variable species both in size and in wing markings, the Indian Museum series ranging from 7 to 12 millimetres in length, all the specimens hailing from Nepal. In the same collection is Bigot's type of his *octonotata* (a *nomen nudum*) which is, I feel convinced, only a varietal form of *insulata*. In it the eight spots referred to are, presumably, (1) a distinct oval spot on the tip of the 2nd vein, (2) on the base of the fork of the 3rd and (3) at the junction of the veinlet joining this to the 2nd, (4) two small contiguous round ones (probably counted as one spot only) occupying the cross-vein between the 4th vein and its adjacent branch, one each at (5) the base of the lower fork of the 4th vein, (6) the cross-vein uniting this to the 5th vein, and (7) one on the base of the intermediate branch of the 4th vein, finally (8) a dark but distinct spot-like suffusion spread over the discal transverse vein and base of the 2nd vein, thus, on the dark part of the wing but much darker. Moreover the 1st posterior cell is closed distinctly before the border. This specimen is from Dehra Dun (foot of the Mussoorie hills). A second specimen of this variety (from Calcutta) shows the 1st posterior cell closed almost *on* the border.

What I take to be the typical form of *insulata* is shown in plate xii, fig. 21, and in this the brown colour of the wings extends further posteriorly and is darker, thus obliterating what I call Bigot's 3rd spot, but which can usually be perceived if examined closely, and which is invariably present in individuals where the brown colour of the wing is less extensive. The same remark applies to the dark spot over the discal transverse vein, which can invariably be discerned, being distinctly darker than the brown colour which, nevertheless, always entirely surrounds it. A principal difference between typical *insulata* and *octonotata* is the presence of two very small spots on the fork of the 3rd vein, also the spot that I call Bigot's 4th is much larger, more irregular, and takes the form either of a single irregularly shaped spot, two contiguous spots or three contiguous and merged spots. My 6th, 7th and 8th spots of Bigot are generally more enclosed by the brown colour. In nearly all the typical specimens there is a foreshortening of the branches of the 4th vein, or appendices to one or more of them, all tending to prove the considerable range through which this species may vary.

15. *brahma*, Sch., 1868, Novara Reise, 118.

Loc.—Ceylon.

**Plate xii**, fig. 22 (wing).

*N.B.*—Schiner does not mention the sex.

16. *semilucida*, Wlk., 1852, Ins. Saunds., pt. 3, 170, ♀ (*Anthrax*).

Loc.—East Indies.

17. *basifascia*, Wlk., 1849, List Dip. Brit. Mus., ii, 248 (*Anthrax*).

Loc.—Bengal. Type in British Museum.

N.B.—Walker does not mention the sex.

18. *albida*, Wlk., 1852, Ins. Saunds., pt. 3, 171, ♀ (*Anthrax*).

Loc.—East Indies.

19. *vitrea*, Bigot, 1892, Ann. So. Ent. Fr., lxi, 344, ♂.

Loc.—Pondicherry. Type in the Bigot collection.

N.B.—In the Pusa collection is a ♂ of what I have little doubt is this species. The wholly clear wings are characteristic of almost this species alone, in this genus; but in the present specimen there is a large white *tomentose* spot towards each side of the abdomen, spreading over the 2nd, 3rd, and 4th segments, leaving the dorsum black. Bigot's "some vestiges of white pile on the sides of the abdomen" is in accordance with this, but I do not perceive the lateral reddishness on the 1st and 2nd segments mentioned by that author.

#### Notes on the genus **EXOPROSOPA**.

Firstly I have to own indebtedness to Mr. E. E. Austen for informing me of the correct place in this genus, of Walker's species *alexon*, *albida*, *auriplena*, *basifascia*, *insulata*, and *semilucida*, all of which that author described under *Anthrax*.

Having seen only twelve out of the nineteen species of *Exoprosopa* given here, it is unsafe to attempt a tabular view of them, but they seem to be separable into five fairly distinct groups.

1. Species with *wholly black* (or deep blackish brown) wings, with at most an absolutely clear small spot at or near the tip. These are the first three species, of which my *latipennis* has absolutely unmarked blackish brown wings, whilst *pennipes* has a clear wing-tip and long black hair on the hind tibiæ, and *lar* is distinguished by the wing being clear on the distal portion only of the posterior border.

2. Species with a *closed 1st posterior cell*. These are my two new species *flavipennis*, with almost wholly yellow wings, and *flammea*, a fiery reddish orange species with clear wings and two dark cross-bands.

3. An isolated species with clear wings and a broad scalloped dark band on the anterior half: *E. collaris*, Wied.

4. Species with a pale grey, yellowish or clear wing, always distinctly marked with a definite pattern, spots, bands, or the oblique baso-costal band so prevalent in this sub-family. This group may be considered to contain the typical species of the genus, and to it belong also a good number of Palearctic and North American species.

In the present list all the species from *lateralis* to *brahma* (inclusive) fall in this group.

5. Species with *clear wings*, or at most a very narrow, pale yellowish anterior margin. The four last species belong here. It should here be mentioned that in Van der Wulp's Catalogue he often quotes "East India" for species described by Walker from the "East Indies."

### ARGYRAMÆBA, Sch., 1860.

Wien. Ent. Monats., iv, 51.

Sch. F. Aust., i, 52.

#### 1. *bipunctata*, F., 1803, Syst. Antl., 118.

Wied., Auss. Zwei., i, 286.

*Anthrax carbonaria*, Wlk., Ins. Saund., pt. 3, 173.

Loc.—Tranquebar [t. *Wied.*]; East India [t. *Walk.*]; Karachi, Purneah District, Calcutta (all India) [*Ind. Mus. Coll. t. m.*].

**Plate xii**, fig. 23 (wing).

*N.B.*—For the synonymy of *carbonaria*, I have to thank Mr. Austen. This species stands apart from all others by the uniformly dark brown wings.

#### 2. *aterrima*, Doles, 1858, Nat. Tijd. Ned. Ind., xvii, 93 (*Anthrax*).

V. d. Wulp, Tijd. Ent., xxiii, 165, pl. x, 9 (wing).

*Anthrax proferens*, Wlk., Pr. Linn. So. Lond., iv, 113, ♂.

Loc.—Amboina [t. *Doles.*]; Macassar (Celebes) [t. *Wlk.*]; Semarang in October, Batavia in July [both Java, t. *Meijere*].

*N.B.*—In this species the distal half of the posterior border of the wing is irregularly clear, the remainder being wholly blackish. In the remaining Oriental species of this genus, the wings are principally clear, with a dark, oblique baso-costal band, with or without other marks or spots.

#### 3. *melania*, Wulp, 1885, Notes Leyd. Mus., vii, 84 (♂?), pl. v, 8 (wing).

Loc.—Java; Astrolabe Bay (Papua) [t. *V. d. Wulp*].

#### 4. *emissa*, Wlk., 1864, Pr. Linn. So. Lond., vii, 233, ♀ (*Anthrax*).

Loc.—North Ceram.

#### 5. *emittens*, Wlk., 1861, loc. cit., v, 148, ♀ (*Anthrax*).

Loc.—Amboina.

*N.B.*—Thanks to Mr. Austen's kind examination I am able to refer this species to this genus.

#### 6. *degenera*, Wlk., 1857, loc. cit., i, 15, ♂ ♀ (*Anthrax*).

Loc.—Singapore, Macassar.

*N.B.*—Three specimens in my collection (? ♂ ♂) from Kandy (Ceylon), taken October and November, 1907, are, I think, referable to this species.

7. **appendiculata**, Big., 1892, Ann. So. Ent. Fr., 347, ♀.

Loc.—Pondicherry. Type in Bigot collection.

8. **fallax**, Meij., 1907, Tijds. v. Ent. L., 244 (no sex mentioned).

Loc.—Semarang (Java) in January.

*N.B.*—Four specimens in the Pusa collection from Chapra (Bengal) are either *fallax* or a new and closely allied species.

9. **gentilis**, mihi, sp. nov., ♂ ♀.

(*Id. id.*, Bigot, *nom. nud.*)

Loc.—Bengal, Assam. Type in Indian Museum collection.

**Plate xii**, fig. 25 (wing).

10 **distigma**, Wied., 1828, Auss. Zwei., i, 309 (*Anthrax*) (= ♀ t. Os. Sack., B. E. Z., xxvi, 112); Macq., Dipt. Ex., ii, 1, 58 (336) (*Anthrax*); V. d. Wulp, Notes Leyd. Mus., vii, 83 (*Argyramæba*); *id.*, Tijds. Ent., xxiii, 166; Os. Sack., B. E. Z., xxvi, 112 (*Argyramæba*).

*Anthrax argyropyga*, Doles., Nat. Tijds. Ned. Ind., xiv, 401.

*Anthrax tripunctata*, V. d. Wulp, Tijds. Ent., xi, 109, pl. iv, 1 (wing).

*Anthrax trimaculata*, V. d. Wulp, loc. cit., p. 110, pl. iv, 2 (wing).

*Argyramæba consobrina*, Big., *nom. nud.* [*Ind. Mus. Coll. t. m.*].

Loc.—Java, Gorontalo, Celebes, Sumatra, Amboina, Salawatty, Timor [all t. *V. Wulp*]; Nicobar Is. [t. *Sch.*]; Phil. Is., Papua, [both t. *Os. Sack.*]; Darjiling and Java [t. *Meij.*]; Dehra Dun, Lucknow, Purneah Dist., Bangalore, Calcutta (all India and all ♀ ♀ of the *trimaculata*, V. Wulp, form) [*Ind. Mus. Coll. t. m.*]; Kandy, Calcutta, Jullundur (India), 5-v-1905, and Mindanao [*Coll. mihi*]; Friedrich Wilhelmshafen and Erima, Astrolabe Bay (Papua) [t. *V. Wulp*]; Semarang in August and Batavia in July [both Java, t. *Meijere.*]. The Pusa collection possesses a good series extending from 27-iv to 8-vi, and again from 21-viii to 30-xi, the localities being Arrah, 13-ix-1907, Thurla, 13-iv-1905, Chapra (all Bengal); Allahabad, 27-x-1905 [*Howlett*], Bombay, iv-1905 (var. *trimaculata*).

Coquillett records it from Japan (under *Spogostylum*).

Type in Leyden Museum.

*N.B.*—I accept Herr Meijere's synonymy as to *trimaculata*, V. d. Wulp, which form is the only one I have seen of the species. It appears to be distributed all over the East and is very variable in size ( $6\frac{1}{2}$  to  $10\frac{1}{2}$  millimetres). A specimen in the Indian Museum,

which was taken on board ship, ten miles from the coast, off Masulipatam (Madras), has the hyaline portion of the wings quite clear, thus agreeing with one mentioned by Osten Sacken from the Philippines (*l. c. ante*).

11. **semiscita**, Wlk., 1857, Pr. Linn. So. Lond., i, 118, ♂ (*Anthrax*).

Loc.—Borneo [t. *Wlk.*]; Celebes [t. *Os. Sack.*].

12. **varia**, F., 1794, Ent. Sys., iv, 259 (*Anthrax*).

For good description see Sch. F. Aust., i, 54.

Loc.—Western Himalayas.

*N.B.*—This species has not before been recorded from the East, but a specimen (♀) taken by the Indian Museum Collector at Bhim Tal (Kumaon District, 4,500 feet, 26-ix-1907) is undoubtedly this species, which is a generally distributed Palæarctic one.

13. **instituta**, Wlk., 1852, Ins. Saund., pt. 3, 183, ♀ (*Anthrax*).

Loc.—East India.

14. **carbo**, Rond., 1875, Ann. Mus. Gen., vii, 453 (*Anthrax*).

Loc.—Borneo. Type (unique) in Genoa Museum.

*N.B.*—My thanks are due to Dr. R. Gestro of the above Museum for kindly examining the type and supplying me with information enabling me to place the species in *Argyramæba*.

15. **ceylonica**, mihi, sp. nov.

Plate xii, fig. 24 (abdomen).

Loc.—Ceylon. Type in my collection. Trivandrum (S. Ind.), xi-08 (*Annandale*) [Ind. Mus. Coll.].

16. **niveisquamis**, mihi, sp. nov.

Loc.—Baluchistan. Type in Indian Museum.

#### *Notes on the genus ARGYRAMÆBA.*

It is difficult to satisfactorily divide the species of this genus, except by an exhaustive table of analysis, which in the present case is impossible, as I have only seen a few of them. *A. bipunctata*, F., and *aterrima*, Dol., are easily separated from all the rest by the practically wholly blackish brown, unmarked wings. The colour is less pronounced posteriorly and the wing has a small clear space in *aterrima*. The others, except *ceylonica* and *niveisquamis*, all have the very common oblique band on the base and costa, more or less clearly cut, with or without additional marks or spots. Two of the three new species that I introduce (*ceylonica* and *niveisquamis*) have the usual appendix to the fork of the 3rd longitudinal vein, also the pencil of hairs at the tip of the antennal style, which also shows the bisection mentioned by Osten Sacken (Biol. Cent. Am., i), but *gentilis*, though I place it here, lacks the appendix and I do not perceive the bisection. The closed anal cell will, however, easily distinguish it. I have introduced most of Walker's species on their own merits alone,

from their inclusion by that author with other species proved to be of *Argyramæba*, because *degenera*, if I have correctly identified it, is the only one of his I have met with myself.

### ANTHRAX, Scop., 1763.

Ent. Carn., 358.

1. *leucostigma*, Wulp, 1898, Termes. Füzet., xxi, 419, nom. nov. for *terminalis*, Wulp, preoc. Wied. (1830), Auss. Zwei., ii, 639, for a Mexican species.

*terminalis*, Wulp, 1868, Tijds. Ent., xi, 108, pl. iii, 12 (wing).

Loc.—Halmaheira. Van der Wulp records two from Astrolabe Bay, Papua.

N.B.—This species should be easily recognised from all others except *satellitita*, Wlk., by its nearly wholly dark brown wings.

2. *satellitita*, Wlk., 1857, Pr. Linn. So. Lond., i, 119, ♂.

Loc.—Borneo.

N.B.—Incorrectly spelt *satellita* in Van der Wulp's Catalogue. This should be easily distinguished from *leucostigma* by the black spots on the clear part of the wing.

3. *afra*, F., 1794, Ent. Sys., iv, 258. Sch. F. Aust., i, 50. *fimbriatus*, Mg. Klass. I, 205; Sys. Bes., ii, 154, pl. xvii, 13.

*sirius*, Hoffsg., in coll. ap. Meig.

*afer*, auct.

Loc.—East Indies [t. *Macq.*]; India and Burma; Senegal and New Holland.

It is also a commonly distributed Palæarctic species.

N.B.—I have taken this species myself at Jubbulpore, 15-xi-1907; Poona, 19-27-xi-1907; Meerut, 25-iv-1905; Jhansi, 1-iv-1905 (all India). The Indian Museum possesses it from the base of the Dawna Hills (Lower Burma), Puri (Orissa, India), 2-iii-1908; Gonda District (United Provinces, India), 26-ii-1907. The Pusa collection has it from Allahabad, 5-19-x-1905 [*Howlett*]; Pusa, 23-v-1906; and Chapra (Bengal).

4. *maura*, L., 1761, F. Suec., 1785 (*Musca*).

N.B.—Two specimens, taken May or June 1893 at Naini Tal, are in the Indian Museum (from the Lucknow Museum) and appear to be this species, although showing a little variation in the wing marking, the black colour being rounded off some distance before the margin instead of attaining the posterior border in the 2nd posterior cell, as in the normal form. The two abdominal cross-bands are of a pale greyish white hair instead of yellowish, the cross-veins do not show any clear space or yellowish colour, the black colour being unbroken except for a nearly clear spot in the upper corner of the 2nd basal cell.

5. **absalon**, Wied., 1828, Auss. Zwei., i, 317.

Loc.—Wiedemann gave “Ostindien,” which Van der Wulp reduces to “Java.” Types in Wiedemann collection and Copenhagen Museum.

6. **referens**, Wlk., 1852, Ins. Saund., pt. iii, 189, ♀.

Loc.—East India.

7. **congrua**, Wlk., 1860, Pr. Linn. So. Lond., iv, 112, ♀.

Loc.—Macassar.

8. **duvaucelii**, Macq., 1840, Dip. Ex., ii, 1, 63 (341), ♂, pl. xx, 7 (wing).

Loc.—Bengal [t. *Macq.*]; Purneah Dist. (India) [*Ind. Mus. Coll. t. m.*]. Type (♂) in Paris Museum.

N.B.—I took one ♀ at Cawnpore, 14-ix-1905, and there are two ♂♂ in the Pusa collection taken at Chapra (Bengal).

9. **troglydyta**, F., 1775, Syst. Ent., 759 (*Bibio*).

Wied., Auss. Zwei., i, 306.

*Anthrax hyalina*, Wied., Dip. Ex., i, 141; *Id.*, Auss. Zwei., i, 297; *Id. id.*, Wulp, Tijds. Ent., xxiii, 165.

*Anthrax lucens*, Wlk., Ins. Saund., pt. iii, 180.

Loc.—Java, East Indies [t. *Wied.*]; Java, Papua [t. *Wulp*]; East India [t. *Wlk.*]; Semarang (Java), one ♂ in November [t. *Meijere*]. Type in Fabricius's collection.

10. **hottentotta**, L., var. nov. *claripennis*, mihi.

N.B.—A ♀ specimen of this common Palæarctic species, taken at Bhura, which is situated in the plains although in the Naini Tal (Western Himalayas) district, 14—17-iv-1907, cannot, I think, be separated specifically from this species.

The minor differences, I perceive, are: the wings are quite clear, except the narrow mediastinal cell; the frons bears only black hairs, except immediately above the antennæ, and the hair on the lower part of the face is yellowish white; the 2nd abdominal segment has a small reddish (ground-coloured) spot at the sides; and the legs are covered more distinctly with yellowish scales, which are nearly whitish on the basal half of the femora.

11. **paniscus**, Rossi, 1790, Faun. Etrus., ii, 276 (*Bibio*).

Loc.—Lower Himalayas. Naini Tal [*Ind. Mus.*, taken by Capt. Lloyd]; Mussoorie and Simla (both October 1906, taken by Mr. Lefroy) [*Pusa Coll.*]; Mussoorie, 4-v-05 [*Coll. mihi*, taken by me]. All the specimens are identified by me.

12. **clara**, Wlk., 1852, Ins. Saund., pt. iii, 179, ♀.

Loc.—East India.

N.B.—Three specimens (I believe ♂♂) undoubtedly of this species are in the Indian Museum collection, one from Dehra Dun (foot of the Mussoorie hills) and two from the Garhwal District, Western Himalayas (6,000 feet). Two other very interesting



examples closely allied to *clara* but I think distinct are described at the end of the catalogue, with a redescription of *clara*, of which Walker considered a 5-line description sufficient.

13. **antecedens**, Wlk., 1860, Pr. Linn. So. Lond., iv, iii, ♀.

Loc.—Macassar.

N.B.—A ♀ in the Indian Museum collection, captured at Dehra Dun (foot of the Mussoorie hills) is named by Bigot as this species. There is also a ♂ from Chitlong (Nepal) and a ♀ from Bhim Tal (4,500 ft., Lower Himalayas), both in the same collection, which are certainly of the same species as Bigot's specimen, but I doubt the identity with *antecedens*, Wlk.

It may be noted that Walker had previously used the name *antecedens* (in his Dipt. Saund., p. 193) for a North American species. As, however, that name is considered by Aldrich as synonymous with *Argyramæba* (*Spogostylum*, Macq. apud Aldrich) *limatulus*, Say., there is no necessity to change the name of the Oriental species.

14. **aperta**, Wlk., 1852, Ins. Saund., pt. iii, 180.

Loc.—East India. Western Himalayas.

N.B.—In the Pusa collection and Indian Museum from Mussoorie, 7,000 feet, Oct. 1906 [*Lefroy*, *Howlett*].

15. **manifesta**, Wlk., 1852, Ins. Saund., pt. iii, 178, ♀.

Loc.—East India.

N.B.—Mr. Howlett has taken it recently at Mussoorie, and as he has compared both *aperta* and this species with the types at the British Museum I have redescribed both species more fully.

16. **fulvula**, Wied., 1821, Dip. Exot., i, 148; *id.*, Auss. Zwei., i, 307.

Loc.—Java. Type in Westermann's collection.

17. **dia**, Wied., 1824, Analec. Ent., 23; *id.*, Auss. Zwei., i, 293.

Loc.—Tranquebar. Type in Westermann's collection.

18. **limpida**, Wlk., 1852, Ins. Saund., pt. iii, 179, ♀.

Loc.—East India.

19. **lucida**, Wlk., 1852, loc. cit., 179, ♀.

Loc.—East India.

20. **leucopyga**, Mcq., 1840, Dip. Ex., ii, 1, 74 (352), pl. xxi, 1 (wing).

Loc.—Timor [t. *Mcq.*]; India [t. *m.*]. Type in Paris Museum.

N.B.—To this species I refer, with but little doubt, three ♂♂ taken by me at Jubbulpore (India), 15-xi-07, and three ♀♀ (?) taken by me at Itarsi (Centr. Ind.), 17-xi-07, and Poona (near Bombay), 19—27-xi-07, all the specimens having been captured in very dry long grass, on hot, dry days. There is a specimen in the Pusa collection from Allahabad, taken by Mr. Howlett, 24-iii-1906.

21. **albofulva**, Wlk., 1852, Ins. Saund., pt. iii, 182, ♂.

Loc.—East India.

*N.B.*—If I have identified this species correctly, it is a widely distributed one throughout at least India. It has been taken by me at Muttra, 22-iv-05; Meerut, 25-iv-05; Ferozepore, 28-iv-05; and by Mr. Howlett at Allahabad, 24—29-iii-06 (all these localities being in India). In size the above examples vary from barely 4 to 6½ mm. The femora are sometimes darker than usual; in other specimens all the legs are wholly pale yellow.

22. **clausa**, mihi, sp. nov., ♂.

Loc.—Lower Burma. Type in Indian Museum.

\* \* \* \* \*

SPECIES DESCRIBED AS *Anthrax*, BUT REQUIRING CONFIRMATION  
AS BELONGING TO THAT GENUS.

1. **angustata**, Dol., 1858, Nat. Tijd. Ned. Ind., xvii, 93.

Loc.—Amboina.

2. **bimacula**, Wlk., 1849, List Dip. Brit. Mus., ii, 254, ♀.

Loc.—China. Type no longer in British Museum, presumably lost.

*N.B.*—Presumably from South China, as most of the older specimens were from that region, but if it is from North China the species will have to be removed from the Oriental list and admitted to the Palæarctic fauna.

3. **pretendens**, Wlk., 1860, Pr. Linn. So. Lond., iv, iii, ♀.

Loc.—Macassar.

4. **prædicans**, Wlk., 1860, loc. cit., p. 112, ♀.

Loc.—Macassar.

5. **apicifera**, Wlk., 1865, loc. cit., viii, p. 111.

Loc.—Papua.

*N.B.*—Of the above five species I can obtain no information as to their generic position.

*Note on Anthrax emarginata*, Mcq.

A species under this name is included by Van der Wulp as an Eastern species, giving Timor as the locality, but I can trace no Oriental reference to the species at all, and Macquart's type was described from Philadelphia, and is, moreover, retained (under *Exoprosopa*) in Aldrich's recent Catalogue of North American Diptera.

In Macquart's figure the venation is certainly that of *Argyramæba*. Van der Wulp places it under *Anthrax*. Moreover,

in the text, Macquart says the venation is similar to that of his *Exoprosopa tricolor*, of which is also figured a wing, and this latter is undoubtedly an *Exoprosopa*. Pending a definite settlement I have withdrawn the species from my list, presuming it to be North American and (incidentally) an *Exoprosopa*.

### Notes on the genus **ANTHRAX**.

The twenty-two species admitted here as belonging to *Anthrax* proper are, I believe, all correctly placed here. Mr. Austen kindly informs me after examinations of the types, that *satellititia*, *congrua* and *referens* belong here; *afra*, *hottentotta* and *paniscus* are well-known Palæarctic species; *duvaucelii*, *clara*, *antecedens*, *albofulva*, *leucopyga*, *aperta* and *manifesta* have all been identified by me (I think, correctly) with specimens in the Indian Museum, Pusa or my own collection, the last two species being confirmed by Mr. Howlett's comparison of them with the types. Of the remainder, a good plate is available of *leucostigma (terminalis)*, whilst *satellititia* is recognisable by the basal two-thirds of the wing being blackish, the outline of the colour denticulate, the clear part containing four spots; to these being added only one new one, *clausa*.

The rest of the species I have retained in *Anthrax* by their association by authors with groups of species belonging wholly or mainly to this genus, and I believe they will all be found correctly placed here.

These are *absalon*, W., *troglodyta*, F., *fulvula*, W., *dia*, W., *limpida*, Wlk., and *lucida*, Wlk.

As regards the grouping of the species, presuming them all to be true species of *Anthrax*, the difficulty is probably greatest of all in this genus. For my own convenience in studying them I have arbitrarily arranged them in "groups," but these may have no scientific value, based as they are on the wing-markings, simply because this character is the one never overlooked by any of the authors, and again, because it is the most lasting character. These "groups" are (1) wings nearly wholly black, *leucostigma* and *satellititia*; (2) wings with the usual oblique, dark, generally clear-cut baso-costal band, *afra* to *congrua*; (3) wing clear, with some slight suffusions on certain veins, *duvaucelii*; (4) wing excessively limpid, with a silvery shining shoulder-spot, *troglodyta*, but the silvery spot occurs in some other species with non-limpid wings; (5) wing practically clear, but always with a more or less narrow (and generally ill-defined) anterior yellowish or pale brownish margin, *hottentotta* to *lucida* inclusive; (6) wings absolutely clear and unmarked, *leucopyga* to *clausa*, the latter being easily known by its closed anal cell.

It is, of course, difficult to draw satisfactory dividing lines between some of these groups, as they are inclined to merge one in the other, and the discovery of additional species will make the separation of species on these grounds still more difficult. I

therefore repeat that my grouping is only made as a temporary guide to the general appearance of the various species.

It will be seen that I have followed Baron Osten Sacken in retaining *Anthrax* as feminine, although, as he states, the Greek word is masculine; and the latter gender is adopted by Prof. Bezzi in the Palæarctic Catalogue.

### COMPTOSIA, Macq., 1840.

Dip. Ex., ii, 1, 80.

1. **brunnipennis**, Wulp, 1868, Tijds. Ent., xi, 110, pl. iv, 3 (wing).

Loc.—Timor.

### NEURIA, Newman, 1841.

Entomol., i, 220.

1. **indecora**, Wulp, 1885, Notes Leyd. Mus., vii, 85, ♂.

Loc.—Pœlœ Gamœ.

### Sub-Family B O M B Y L I I N Æ .

### BOMBYLIUS, L., 1761.

Faun. Suec., 1918.

1. **orientalis**, Macq., 1840, Dip. Ex., ii, pl. 1, 90 (368), ♂, pl. vi, 2 (full insect and head).
- tricolor*, Guérin, 1829—1838, Icon. du regne anim., iii, 538, pl. xcv (full insect).

Loc.—Java [t. *Macq.*]; Bengal and South India [t. *m.*].

Type (♂) in Paris Museum.

*N.B.*—In the Indian Museum collection are four specimens from Bangalore (South India) and Ranchi (North Bengal) of this handsome and unmistakable species; and in the Pusa collection are two others taken at Palamou and Chapra (both Bengal).

I have no hesitation in considering Guérin's *tricolor* as a synonym of Macquart's species, of which Guérin himself said it might be a variety. Both his description and his coloured figure agree with the specimens I have seen from India. Guérin described his species from Java.

2. **maculatus**, F., 1775, Syst. Ent., 803.

Wied., Auss. Zwei., i, 342, ♂.

Loc.—Tranquebar [t. *Wied.*]. Type in the Fabricius collection.

*N.B.*—A specimen in the Indian Museum collection from Chatrapur (Ganjam Dist., Madras Presid., on the borders of Bengal Presidency) appears to be this species, but is too damaged for definite identification.

3. **major**, L., 1761, F. Suec., 1918.

Sch. F. Aust., i, 60, et. auct.  
*sinuatus*, Mik. Mon., Bomb. Bohem., 35, 4,  
 pl. ii, 4.  
*variegatus*, D.G., Ins. ed. Gotze, vi, 107,  
 pl. xv, 10.  
 var. *australis*, Lw., Neue Beitr., iii, 14.

Loc.—Simla hills (8,000 to 8,400 ft.). Taken by Dr. Annandale, 28-iv-07 and 4-v-07 [*Ind. Mus. Coll. t. m.*].

N.B.—The specimens do not vary from the common European form, which also extends to North America.

4. **fulvipes**, Big., 1892, Ann. So. Ent. Fr., 362, ♂.

Loc.—Pondicherry [*Big.*]; Punjab [*Pusa Coll. t. m.*]. Type ♂ in the Bigot collection.

N.B.—Bigot described only the ♂ of this species. A specimen in excellent condition from Allahabad, taken by Mr. Howlett, 19-x-05, is in the Pusa collection, and as it is a ♀ (which I think has not been described), I add a description at the end of the catalogue, having practically no doubt of its identity with Bigot's species.

5. **albosparsus**, Big., 1892, loc. cit., 362, ♂ ♀.

Loc.—Pondicherry. Type ♂ ♀ in Bigot's collection.

6. **terminalis**, mihi, sp. nov., ♂.

Loc.—Punjab. Type in the Pusa collection.

7. **vicinus**, mihi, sp. nov., ♀.

Loc.—Punjab. Type in the Pusa collection.

N.B.—Possibly the ♀ of *terminalis*, but I think distinct.

8. **erectus**, mihi, sp. nov., ♂ ♀.

**Plate xii**, 27 (abdominal spines).

Type ♂ ♀ in Indian Museum. Co-types in British Museum and my collection.

Loc.—South India.

N.B.—A very conspicuous species by the strong erect spines on the abdomen.

9. **wulpia**, mihi, nom. nov.

*Bombylius pulchellus*, Wulp, 1880, Tijds. v. Ent.,  
 xxiii, 164, pl. x, 8 (full insect ♀, coloured).

*Comastes pulchellus*, Wulp, Cat. Dip. S. Asia, 74.  
*Eucharimyia dives*, Big., Ann. So. Ent. Fr., Bull.,  
 p. cxl.

Loc.—Java [t. *Wulp*]; Ceylon [t. *Bigot*]; Tenmalai (S. India), 22-xi-08 [*Annandale*].

N.B.—As this species is not a *Comastes* but a *Bombylius*, the name requires altering, *pulchellus* being preoccupied by Loew in 1863 for a North American species.

*Comastes* is not Oriental, and moreover, the name should be discarded for *Heterostylum*, Macq. (*vide* my future notes).

*Notes on the genus* **BOMBYLIUS**.

Of this genus Van der Wulp gave seven species as Oriental. Of these, two (*ardens* and *socius*) belong to *Systæchus*, whilst another, *tricolor*, Guérin, I am convinced, is only a synonym of *orientalis*, Macq. To the remainder I add the common Palæarctic species *major*, L., and three new ones.

**SYSTÆCHUS**, Lw., 1855.

Neue Beits., iii, 34.

1. **ardens**, Wlk., 1849, List. Dip. Brit. Mus., ii, 284.

Loc.—East Indies. Type in British Museum.

2. **socius**, Wlk., 1852, Ins. Saund., pt. 3, 201, ♀.

Loc.—East Indies.

*N.B.*—Van der Wulp in his catalogue quotes “East India” for both species, but, although it has since been taken in East India and in the Western Himalayas, he probably only intended to copy Walker’s locality. As Walker, in describing the latter species, says that it belongs to his “group L., of the List Dip. Brit. Mus.,” to which his *ardens* also belongs, I place them both under *Systæchus*, to which genus Mr. Austen informs me *socius* belongs. Moreover I have a ♂ *Systæchus* taken by me at Mussoorie 20—26-v-05, agreeing exactly with Walker’s description; and a specimen in the Pusa collection, taken in April 1906 at Mohanpur (Bengal), is also in all probability this species.

3. **eupogonatus**, Big., 1892, Ann. So. Ent. Fr., 365, ♂ ♀.

Loc.—India. Type ♂ ♀ in Bigot’s collection.

**ANASTÆCHUS**, Os. Sack., 1877.

West., Dipt., 251.

1. **longirostris**, Wulp, 1885, Notes Leyd. Mus., vii, 85, ♀.

Loc.—Himalayas.

**DISCHISTUS**, Lw., 1855.

Neue Beit., iii, 45.

1. **resplendens**, mihi, sp. nov., ♂ ♀.

Loc.—India and Assam.

**TOXOPHORA**, Mg., 1803.

Illig. Mag., ii, 270.

1. **javana**, Wied., 1821, Dip. Ex., i, 179.

Wied., Auss. Zwei., i, 363.

Loc.—Java. Type in Westermann’s collection.

**Plate xii**, fig. 28 (full insect in profile).

*N.B.*—A ♂ and ♀ in the Indian Museum collection were taken in Calcutta, 7-v-07 and 7-vi-07, respectively. I have myself taken both sexes in Calcutta, 26-ix-04 and 30-x-04.

2. **zilpa**, Wlk., 1849, List Dipt. Brit. Mus., ii, 298.

*Loc.*—China. Type in British Museum.

*N.B.*—I retain this species as Walker quotes merely “China,” and it is advisable to retain the species from South China, at least for the present, in the Oriental lists, but I do not know of the species occurring in any truly Oriental locality.

### **GERON**, Mg., 1820.

*Sys. Besch.*, ii, 223.

1. **simplex**, Wlk., 1859, Pr. Linn. So. Lond., iii, 90, ♂.

*Loc.*—Aru Islands.

*N.B.*—Van der Wulp records one ♂ and four ♀ ♀ from Selœ (Berlinhafen) and Erima (Astrolabe Bay), both Papua.

2. **argentifrons**, mihi, sp. nov., ♂ ♀.

Type ♂ in Indian Museum; ♀ in the Pusa collection

*Loc.*—Lahore, 9-v-08 [*Annandale*]; Pusa.

*N.B.*—This species must be allied to Macquart's *australis*, described from Port Jackson, and at first I thought it was that species. A closer examination seems to point to its being distinct. Macquart's species was described in his Dip. Ex., ii, 396, pl. xiii, 2 (1840), the plate showing a full insect and the head in profile.

### **PTHIRIA**, Mg., 1803.

*Illig. Mag.*, ii, 268.

1. **gracilis**, Wlk., 1852, Dip. Saund., pt. 3, 194, ♂.

*Loc.*—East India.

### **SYSTROPUS**, Wied., 1820.

*Nov. Gen. Dipt.*, 19.

1. **eumenoides**, Westw., 1842, Mag. de Zool. (1842), 4, pl. 90.  
Westw., Tr. Ent. So. Lond. (1876), 575, pl. x, 13.

*Loc.*—East India.

2. **ophioneus**, Westw., 1849, Tr. Ent. So. Lond., v, 233,  
pl. xxiii, 6 (full insect).

Westw., Tr. Ent. So. Lond. (1876), 574.

*Loc.*—East India.

3. **sphegoides**, Wlk., 1860, Pr. Linn. So. Lond., iv, 113.

*Loc.*—Macassar (Celebes).

4. **polistoides**, Westw., 1876, Tr. Ent. So. Lond., 575  
Loc.—Siam.

5. **tipuloides**, Westw., 1876, loc. cit., 576.  
Loc.—Sulu Isle (Malay Arch.).

6. **blumei**, Voll., Versl. en meded. K. acad. wet., xv, 8, fig. 4.  
Loc.—Java.

7. **tessellatus**, Voll., loc. cit., 9.  
Loc.—Sumatra.

8. **nigricaudus**, mihi, sp. nov., ♂ (?).  
(*Id. id.*, Bigot, *nom. nud.*)

Type in Indian Museum.

Loc.—Sikhim, Soondrijal (Nepal), Mussoorie (in September).

\* \* \* \* \*

#### DESCRIPTIONS OF NEW SPECIES, AND REDESCRIPTIONS OF PREVIOUSLY KNOWN ONES.

##### ***Hyperalonia aurantiaca*, Guérin.**

##### *Redescription.*

Bengal. Long. 13 mm.

*Head*.—Frons moderately widened, a little more than  $\frac{1}{4}$  the width of the head, black. Face pale, the face and frons covered with thick golden pubescence, thinning on the frons towards the vertex. On the frons the pubescence is mixed with longer erect black hairs. On the face, pubescence extends to midway between antennæ and insertion of proboscis. Back of head thickened, black, sparsely yellow, pubescent, except at extreme lower part, which is bare, greyish black. Proboscis equal in length to height of head, fairly stout, dark brown, with a few short whitish hairs. Palpi rather more than  $\frac{1}{3}$  of the length of proboscis, greyish brown, hairy, the hairs whitish. First antennal joint very nearly twice as long as 2nd, which is slightly flattened and rounded, both clothed with stiff black bristly hairs, and both grey-brown in ground colour; 3rd joint blackish grey, bare, equal in length to 1st and 2nd together (exclusive of the style, which is a little more than  $\frac{1}{2}$  the length of the 3rd).

*Thorax*.—Ground colour of dorsum black, of sides ash-grey. Whole thorax covered with bright yellow hair, which is thickest and deepest on the anterior border and at the sides of the dorsum and behind the wings. The hair just below the wings is paler yellow, becoming whitish on under side; the hair on the dorsum being short and sparse. Along the sides of the dorsum and behind the wings are a few isolated strong black bristles. Scutellum



blackish, with a reddish tinge on the border, clothed with short bright yellow hair and with a row of black bristles on the posterior border.

*Abdomen* obtusely conical; ground colour black. The middle third of the dorsum forms a nearly bare, black centre stripe with a few black hairs; the outer third on each side is covered with numerous bright yellow narrow elongated scales, lying close together, and extending from the base to the posterior border of the 5th segment, being replaced on the 6th and 7th segment by similar scales which are silvery white; these, seen from behind, appearing to form four silvery spots. The whole abdomen is shortly pubescent with black bristles, and the posterior border of each segment has a row of longer bristles. The *sides* of the first three segments of the abdomen are clothed with long yellow hair, which almost become scales; from thence to the tip being replaced by stiff black bristles. Belly black with black bristles and hairs, the major portion of the basal half (except at the sides) being clothed with dense silvery white scales, amidst and above which are silvery white hairs. A genital organ, considerably retracted, is visible, consisting of a pale yellow tubular appendage encircled by a reddish brown semi-circular plate bearing stiff black bristles on its edges: above this is a thick, sub-conical organ, black, with greyish shimmer at the sides, thickly covered with short black spines and cloven at the tip.

*Legs*.—Coxæ ash-grey, clothed with long pale yellowish hair, with which are intermixed a number of very strong long black spines. Femora black, with small dark grey scales and a little soft, short black hair; fore pair spineless, middle pair with a row of short bristly hairs above and two short strong spines close together on the under side just beyond the middle; hind pair generally beset with short black bristles, and with a row of rather strong short ones on under side. Tibiæ black, shortly spiny, with minute blackish grey scales, the spines being longest on the hind pair. Tarsi black, minutely pubescent.

*Wings*.—Dark brown (deepest along the costa), becoming lighter towards the posterior border, which is dark grey. A violet iridescence in certain lights. Anal cell narrowly open. Shoulder of wing beset with stiff, short black bristles, and covered at its extreme base with short orange bristles. Tegulæ dark brown with a fringe of rather long, very close, bright yellow scaly hair. Halteres reddish brown, knob very distinct, oval, placed in the cup-shaped enlarged tip of the stem, pale orange, with greyish tomentum.

*Described* from two specimens, one in the Indian Museum and one in the Pusa collection, both captured at Chapra, Bengal.

*N.B.*—I have practically no doubt that this is Guérin's species, although the markings of the abdomen are not quite like his figure, which shows an interrupted dorsal black stripe to the abdomen, with lateral extensions, and in his figure the dark part of the wing is more clearly defined and not so extensive. Moreover it was from Bengal that he described it.

***Hyperalonia suffusipennis*, mihi, sp. nov.**

(Plate xii, fig. 15, wing.)

♀. India. Long. 15 mm.

*Head*.—Frons orange, paling to yellow below antennæ; vertex black; orbit of eyes black above, red at sides and below; antennæ orange-red, 3rd joint black, 1st and 2nd joints with yellow hair above and below; short golden yellow pubescence over the face; eyes bare with slight crimson reflections in certain lights.

*Thorax*.—Black, with rather thick yellowish hair, which is thicker, longer and deeper in colour on the shoulders, and thick and whitish below the wings. Scutellum tawny brown, with short yellow hair, and a row of stiff long black hairs on posterior border.

*Abdomen*.—Blackish; dark reddish towards the sides of the 2nd and 3rd segments. Dorsum covered with moderately thick yellowish hair at sides, and posterior borders of segments also. Belly with whitish hair.

*Legs*.—Brownish tawny, coxæ with whitish hair, tarsi nearly black.

*Wings*.—Pale grey; darker and more yellowish on anterior and basal parts; a slight but distinct suffusion at nearly all the junctures of the veins and cross-veins. Halteres pale yellowish white; tegulæ similar with a fringe of thick yellow hair.

*Described* from two ♀ ♀ (in good condition) in the Indian Museum from the Purneah District, India. A very distinct species.

***Hyperalonia devecta*, Wlk.***Redescription.*

♀ (?). Long. 17 mm. Expanse between wing-tips 42 mm.

This species resembles *doryca*, Boisd., in so many characters that it will be sufficient to denote the differences. The 1st antennal joint is dark ferruginous, the remainder black, 3rd joint elongated, bare, with a long cylindrical style; 1st and 2nd joints with thick black bristles. The reddish colour of the frons extends almost to the vertex. The mouth has a few short, soft, yellow hairs only, *no bristles whatever*. In the *thorax*, the colour of the tuft of soft hair on the sides behind and below the humeral calli is nearly as deep orange as the bunch of scaly bristles in front, whilst the hair on the sides of the thorax below this part is bright yellow, the bunch of white hairs towards the under side being present.

In the *abdomen* (considerably *denuded*) the sides of the 2nd segment are *dull red*, there is no trace of a white band on the 3rd, although it may have been present, and the white spots at the tip are indistinct (owing to the condition of the specimen) but apparently are the same as in *doryca*, the upper pair of spots being possibly smaller. All the *legs* are blackish.

*Wings*.—Ground colour, rather dark grey, the extreme base is tawny yellow, which colour suffuses more or less narrowly the costa and most of the veins. The central portion of the wing is blackish, becoming merged in the grey, posteriorly and towards the tip. The 2nd posterior cell is equally wide at base and at tip. Halteres dull reddish orange, stem darker.

*Described* from a single ♀ (?) in my collection, labelled "Key Ins." Though I do not know on whose authority it is identified, there is little doubt of it being Walker's species, with whose description it agrees, the only discrepancy being the reddish instead of black 1st antennal joint. This species *may prove synonymous* with *satyrus*, F., *my specimen* agreeing very closely with Van der Wulp's description of that species, and fairly well with his plate.

### ***Hyperalonia doryca*, Boisd.**

#### *Redescription.*

♀ (?). Long. 15 mm.

*Head*.—Frons rather narrow on vertex, widening until at the upper part of the mouth-border it attains a width of nearly one-third that of the head: blackish grey with black bristly hair. Lower half of frons and the whole face round and below the antennæ (where it is somewhat prominent), rather bright ferruginous red, with short black bristles. Ocelli very small, close together, at some distance from the eyes and well below the vertex. Antennæ missing, except a single basal joint which is dark ferruginous (nearly black) with thick black bristles. Proboscis black with two apical, striated leaf-shaped ferruginous lamellæ and a stiff, pointed, central, spike-like organ. Mouth-border rather thickly beset with short black bristles. Eyes dark red with bronze reflections, facets very minute, uniform. Back of head dark grey with a fringe of short bright yellow pubescence.

*Thorax*.—Dorsum black, covered with sparse, very short, yellow pubescence. On the front of the anterior border is a fringe of thick orange-yellow bristly hair, with some shorter soft black hair behind, which probably spreads sparsely over the whole dorsum, standing above the short yellow pubescence. On the posterior border of the dorsum is a row of strong black bristles. On the shoulders this black hair becomes very bristly, and is supplemented by three powerful long black spines just before the insertion of the wings. Just below the humeral calli is a dense bunch of long, fiery orange, erect, scaly bristles, behind which is a large tuft of pale creamy orange, silky pubescence. The fiery orange bristles extend forwards and below, joining the lower part of the anterior fringe of similar colour. The posterior calli bear a similar bunch of dense, similarly coloured bristles. From these calli four powerful long black spines spring, deflected backwards. The sides of the thorax are cinereous grey, with long black bristles below the base of the wings and a dense cluster of them around the fore coxæ,

with a bunch of quite white soft pubescence behind. Long black bristles on the lower part of the thorax in front. Scutellum blackish, posterior border dull red, with long black spines; dorsum with short yellow hairs.

*Abdomen*.—Black, apparently sparsely covered with short black bristly pubescence. Base of 2nd and 3rd segments with a narrow band of yellowish white hairs; 6th and 7th segments with two spots each of silvery white elongated scales. Sides of abdomen with thick black bristles, except where the transverse bands attain the edge. Belly black, with greyish pubescence towards the base and black bristles on the apical half: the basal three or four segments with a transverse band of silvery white scales on each.

*Legs* black, with black bristles, which are most numerous on the femora and hind tibiæ, the posterior tibiæ being dark reddish brown, the hind tarsi dark reddish brown with short black bristles and golden brown pubescence.

*Wings*.—Pale grey. The costal and sub-costal cells wholly, the marginal cell very narrowly, dark brown, the colour reaching to the posterior border at the base of the wing, and extending throughout the 1st basal cell and slightly beyond the discal transverse vein, the anal vein being very slightly suffused. Anal cell distinctly open, though contracted at the border, 2nd posterior cell  $1\frac{1}{2}$  times as wide on the border as at base. Tegulæ reddish brown with a thick fringe of fiery orange scaly bristles. Halteres black, club egg-shaped.

*Described* from one ♀ (?) in my collection from Key Island.

*N.B.*—I do not know on whose authority the above specimen is identified, but it is the only one I have seen purporting to be this species. It is to be noted that in Doleschall's figure of his *ventrimacula* the anal cell is *closed*, not open as in mine and as is shown in Macquart's plate of his *audouini*, and that the *face* of mine is distinctly reddish, which is not mentioned in any of the synonymic descriptions.

### ***Exoprosopa latipennis*, mihi, sp. nov.**

♀. Assam. Long. 18 mm.

*Head*.—Frons dark tawny brown, rather velvety, wide, with a few scattered black hairs; three ocelli on minute protuberance on vertex. Antennæ, 1st and 2nd joints dark brown, with black bristles (3rd joint wanting). Under side of head brown, not produced downward below the eyes.

*Thorax*.—Black, with bright, rufous, thick hair round sides and in front. (Dorsum denuded of hair.) Black hairs on lower part of thorax. Scutellum black (denuded) with traces of a row of black hairs or fine bristles on posterior edge.

*Abdomen*.—Black, elongated, with parallel sides, rounded at tip (upper side mostly denuded); 1st segment with a bunch of long, thin, black, erect hairs in centre, sides of 2nd, 3rd and 4th

segments narrowly brick-red. Sides of abdomen with rather thick yellow hair, which becomes thinner and paler towards the tip. Belly black, with black hairs, central segments paler in the middle.

*Legs*.—Dark brown, bare; hind femora with a row of spines below.

*Wings*.—Uniformly rich dark brown, unmarked; wide across the centre.

*Described* from a unique ♀ in the Indian Museum from Shilong (Assam). The type is in good condition except for the partial denudation of the abdomen. The species is quite distinct from all others.

***Exoprosopa flavipennis*, mihi, sp. nov.**

♀. Bengal. Long. 14–18 mm.

*Head*.—Frons and ocelli as in *flammea*. Frons orange with golden orange, close, short hairs. Mouth-border yellow, antennæ orange: 1st two joints sub-cylindrical, wider at tip, with yellow hairs, 2nd shorter than 1st; 3rd joint twice as long as first two together, bare, the upper side quite straight, the under side rapidly narrowing from base to tip, a very distinct cylindrical style at tip. Proboscis brown, shorter than the head. Eyes reddish brown, bare, with small, uniform facets. Back of head reddish orange, bare, considerably prominent, with a narrow fringe of very short bright yellow hairs on the margin of the cavity behind.

*Thorax*.—Ferruginous orange with black dorsum and blackish grey under side. A fringe of long yellow hair on anterior margin; a bunch of fiery orange-red bristly hairs on shoulders, and shorter similar ones on the humeral calli; the dorsum clothed with moderately close, short orange hairs; several long fiery orange-red bristles, directed backwards, on the posterior calli. Under side nearly bare, a few blackish hairs here and there. Scutellum orange-red, covered with short, similarly coloured pubescence; posterior margin with a horizontal row of concolorous strong bristles.

*Abdomen*.—Sub-conical; ground colour black, apparently with short, close, black pubescence. A bunch of orange-red hairs at the shoulders of the 1st segment; sides of 2nd segment dull reddish. Belly black, unmarked. Genital apparatus in one specimen, orange, subspherical, slightly protruding, and apparently twisted to the left.

*Legs*.—Coxæ and femora dark brown; anterior tibiæ brownish yellow, hind pair black; all the knees pale; tarsi black; fore legs practically bare, posterior, minutely pubescent and with distinct black bristles, which are stronger on the hind pair; posterior tarsi closely pubescent, with black bristles on under side.

*Wings*.—*First posterior cell closed some distance before the border* as in *flammea*. Rather more than the proximal half bright orange-yellow, apical part and a narrow margin along the posterior margin almost to the base, quite clear. An intermediate dark brown,

ill-defined cross-band, commencing at the upper edge of the marginal cell, the width of the band being about one-third of the length of the 1st sub-marginal cell, across the middle of which it passes; continuing across the middle of the closed portion of the 1st posterior cell, the distal half of the discal cell and the bases of the 2nd and 3rd posterior cells, after which it is narrowed to a streak and turning, extends towards the base of the wing, separating the yellow part from the clear margin. Tegulæ reddish orange with a short dense fringe of concolorous hair.

*Described* from two specimens from Pusa (Bengal). One (type) in the Pusa collection, taken 19-iv-07; the other in the Indian Museum collection, taken 25-v-06.

*N.B.*—These two species, *flammea* and *flavipennis* are distinct from all the other Eastern *Exoprosopæ* known to me, by the 1st posterior cell being closed some distance before the border, the 4th longitudinal vein meeting the 3rd before the origin of the anterior branch of the latter (in *flammea*), or just below it (in *flavipennis*). They therefore belong to the group for which Rondani established the genus *Argyropsyla* (emended by Verrall from *Argyropsyla*), but which the late Baron Osten Sacken says (Biol. Cent. Am. Dip., i, 78) cannot be sustained, this character in various species showing all stages between a closed and open cell, sometimes even in the same species. Of the species of *Exoprosopa* admitted in this paper the following have not been seen by me; I cannot say, therefore, whether any of them possess a closed posterior cell or not: *alexon*, *auriplena*, *semilucida*, *basifascia*, *albida*, all by Walker.

### ***Exoprosopa flammea*, mihi, sp. nov.**

♀. Bengal. Long. 18 mm.

*Head*.—Entire frons and face orange-yellow, covered with short golden yellow hairs; lemon-yellow round the mouth, with short bright yellow hairs. Frons at level of antennæ one-third the width of the head, narrowing towards vertex. Ocelli small, close together in front of the vertex. Antennæ *missing*, except 1st joint which is reddish. Proboscis brown, shorter than length of head. Eyes dark reddish brown, facets very small, uniform. Back of head brick-red, rather prominent, with sparse, short golden yellow hairs.

*Thorax*.—Cinereous; humeral and posterior calli orange-tawny, the latter bearing five or six concolorous bristles pointing backwards. The anterior border and shoulders are covered with thick long fiery reddish yellow hair, which is also abundant behind the wings. The dorsum (slightly denuded) is evidently lightly clothed with short orange-yellow hairs. Under side of thorax cinereous, with a moderate amount of orange-yellow hair. Scutellum reddish brown, the posterior margin bearing a row of concolorous strong bristles directed backwards and downwards. Dorsum with sparse yellowish hairs.

*Abdomen*.—Sub-conical, ground colour chiefly reddish brown, 2nd segment with a narrow anterior, and rather wider posterior band connected by a thin dorsal stripe, a rather wide irregular, not well-defined black transverse band on 3rd segment, which is repeated less distinctly on the following two or three segments. The extreme posterior border of all the segments is reddish brown, and the whole dorsum is covered lightly with short, bright orange hairs, which become brightest, longest and fiery red at the abdominal tip. Belly cinereous, posterior borders of all the segments orange-yellow; whole belly covered with short orange hairs.

*Legs*.—Coxæ, femora and most of the tibiæ reddish orange, the tibiæ towards the tips (especially the hind pair) and all the tarsi, black. The middle femora have a few black short spines below, the hind pair a row of stronger ones; the posterior tibiæ are beset with black short bristles, which are longer on the hind pair. The posterior tibiæ have a circlet of strong black spines at the tip, and the whole legs, especially the tibiæ and tarsi, are minutely but densely spinose.

*Wings* clear; *first posterior cell closed some distance before the border*, the 4th longitudinal vein joining the 3rd just above the junction of the anterior branch of the 3rd. Two broad dark brown bands. Base of wing bright orange-yellow, the colour extending across the wing from the costa to (and including) the alula, and reaching distally as far as to just enter the two basal cells. The costal cell is orange-yellowish, also a spot on and over the discal cross-vein, and another small spot in the centre of the upper basal cell.

The first brown band begins in the upper basal cell, which it fills, extending posteriorly, filling the 2nd basal cell and basal fourth of discal cell, thence narrowing, to the hind border of the wing, leaving about the distal fourth of both the anal and axillary cells clear. The second band begins approximately on the costa, blending with the orange colour of the costal cell, fills three-fourths of the 1st submarginal and 1st posterior cells, thence narrowing somewhat, it fills nearly the distal half of the discal cell and terminates distinctly clear of the posterior margin of wing, entering the 2nd and 3rd posterior cells. A small round quite clear spot is in the extreme upper angle of the lower basal cell. A few very short stiff black bristles at the base of the costa, and some short close yellowish orange hairs on the margin of the alulæ and the orange tegulæ. Halteres yellow.

*Described* from a single ♀ in the Indian Museum collection, taken at Pusa, Bengal, 17-iv-07.

**E. *lateralis*, mihi, sp. nov.**

(Plate xii, fig. 17, wing.)

♀. Calcutta. Long. 14-18 mm.

*Head*.—Dark brown, cinereous on vertex, with numerous stiff black hairs and soft, golden rufous hair. Antennæ brown, 1st and 2nd joints with black bristles.

*Thorax*.—Black (dorsum<sup>m</sup> denuded), with thick, bright ferruginous hair in front, at the sides, and below. Lower part of thorax bare, with ferruginous marks. Scutellum dull red ferruginous, base brown with a row of long black spines on posterior border. Traces of golden yellow pubescence on (at least posterior part of) scutellum.

*Abdomen*.—Elliptical oval. Black, the sides more or less broadly brick-red; this coloration is very variable in quantity, as in one specimen it only moderately narrowly borders the abdomen, and in another one it extends so far inwards as to reduce the black part almost to a dorsal row of spots. Bunches of ferruginous hair at each side of 1st and 2nd segments, and a small tuft of stiff black hairs at the sides of each segment. The dorsum is thinly covered with short tawny yellow and black hairs. Last segment reddish, black at the middle of the base. Belly brownish brick-red with sparse yellow hair.

*Legs*.—Tawny brown: hind femora and tibiae with short black spines.

*Wings*.—Dark brown, tip, and posterior border nearly to the base, clear, the clear part extending into the discal cell. Traces of a small, round, clear spot in upper corner of 2nd basal cell.

*Described* from three ♀♀ in good condition in the Indian Museum from Calcutta.

### **E. retrorsa**, mihi, sp. nov.

(Plate xii, fig. 19, wing.)

♀. Persia (Bushire). Long. 15 mm.

*Head*.—Frons moderately broad, yellowish grey with yellow hair. Antennae black, 2nd joint short, first two joints cylindrical, cup-shaped at tips, 3rd longer than 2nd, but shorter than 1st, onion-shaped, with short, distinct style. Posterior orbit of eyes very narrowly fringed with grey hairs.

*Thorax*.—Dark grey, covered with greyish yellow hair, which is thickest in front and at the sides; a few long, strong black bristles on sides of thorax and several on the posterior calli, directed horizontally backwards.

*Abdomen*.—Broadly ovate, blackish; the posterior borders of segments with rather thick yellowish grey hair, which is also present to some extent on the surface of the segments. A bunch of nearly white hairs on each side of first and second segments, and this is extended less thickly down the sides of the abdomen. Belly similar to dorsum.

*Legs*.—Tawny brown, with short, black, stiff hairs, and a row of small black bristles on under side of all the femora.

*Wings*.—Pale grey, veins ferruginous brown, and showing a rather abnormal form of venation. The veinlet joining the upper branch of the third longitudinal vein is deflected backwards instead of being more or less vertical, and does not meet the second



longitudinal until nearly half-way towards its base, where a short stump vein connects the latter with the third longitudinal directly over the upper transverse vein, and where also a distinct appendix is directed backwards. On the upper and lower transverse veins, base of second longitudinal, and at each spot where the veinlet joins this to the third longitudinal is a small suffusion; also a similar spot in the centre of the upper basal cell. Anterior part of wing slightly yellowish.

*Described* from a perfect unique specimen in the Indian Museum collection. A very conspicuous species.

***Exoprosopa annandalei*, mihi, sp. nov.**

(Plate xii, fig. 20, wing).

♀. Lower Burma. Long. 9-12 mm.

*Head*.—Vertex, frons and face blackish, with short sparse yellowish hairs, and some stiff bristly black hair on frons which is considerably narrowed on the vertex, where the ocellar triangle is very small. Mouth-opening yellowish, proboscis dark brown, palpi black, short, filamentous, with a single row of hairs. Antennæ yellowish, first joint hairy, third rather elongated, with moderately long style. Back of head dark grey, eyes dark brown, with some yellowish hair, which is whitish behind the eyes.

*Thorax*.—Blackish; tawny yellow hair rather thickly placed on fore border, and on the sides, where there is a pale tawny spot on the pleuræ. Dorsum nearly bare (? denuded). Scutellum light brown, posterior border with a row of black spiny bristles and short sparse yellowish hair. Metanotum hidden.

*Abdomen*.—Ovate, chestnut-brown (ground colour), with a row of dorsal black irregularly oval spots at the base of each segment, and with traces of a narrow black line almost on the posterior borders of some of the segments. A sparse band (interrupted in the middle) of whitish short hairs on the anterior part, and a similar band of blackish hairs on the posterior part, of each segment; the second segment possessing a basal row of short sparse tawny hairs and a bunch of white longer hair on each side at the base. The short whitish hairs on the dorsum may possibly extend over the greater part of the surface, and appear more like scales than hairs. Belly chestnut-brown, with irregular black marks and with short white scaly hairs generally distributed over it.

*Legs*.—Tawny brown, fore coxæ similar, posterior coxæ blackish brown; hind femora with a few hairs below, posterior tibiæ moderately covered with short bristles; tarsi, blackish brown, minutely pubescent below.

*Wings*.—Pale grey with a dark brown oblique baso-costal band, which has an indentation on the lower side. The brown colour extends along the costa to the tip of the first longitudinal vein, its outer edge extending posteriorly to just behind the second

posterior cell, the colour thus filling slightly more than half the first longitudinal and discal cells, and extending in an irregularly straight line from the latter cell to the base of the wing, filling half the anal cell. Round brown spots, all of equal size, are placed at the tip of the second longitudinal vein, at the base of the fork of the third longitudinal and at the tip of the veinlets dividing the second, third and fourth posterior cells. On the upper corner (adjoining the base of the discal cell) of the lower basal cell, a small bluish opalescent spot. At extreme base of wings and along the stronger veins a distinct tawny colour. Halteres yellowish white.

*Described* from two ♀ ♀ in perfect condition (the thorax and abdomen show very little trace of denudation). Types in Indian Museum collection, taken at Moulmein, Lower Burma, 6-iii-08, by Dr. Annandale, after whom I have pleasure in naming this handsome species, which, he says, was not rare in that locality.

***Argyramœba gentilis*, mihi, sp. nov.**

(Plate xii, fig. 25, wing.)

(*Id. id.*, Bigot, *nom. nud.*)

♂ ♀. Bengal (♂), Assam (♀). Long.  $4\frac{1}{2}$  mm.

*Head*.—Frons and face dull black, with black hairs; antennæ black, third joint much flattened, forming an irregularly oval disc, style distinct, black, no apparent bisection, with small pencil of short hairs at tip. Proboscis short, thick. Back of head blackish grey, bare.

*Thorax*.—Black, with a collar of stiff black hairs on anterior margin, and soft black hairs on dorsum and sides, intermixed with some black bristles on the shoulders and posterior calli. Posterior margin with some long black bristles deflected backwards. Scutellum black, with short black pubescence, and some longer, curved bristles on posterior border.

*Abdomen*.—Dull black, with short, rather sparse black pubescence, and a bunch of long black hairs on each shoulder. Some black hairs at the sides and some longer, thicker black hair at tip. Belly black.

*Legs* black, minutely pubescent; tibiæ a little lighter, with short black bristles (including fore pair).

*Wings* clear, elongated, *anal cell closed*. A blackish brown band from the base, extending along the costa to just above the fork of the third longitudinal vein. The rather irregular proximal border of this band extends to the posterior wing-border, just in front of the anal cell, which the dark band wholly fills. The band does not quite reach the fork of the third vein, nor the outer transverse. Near the wing-tip is an oblong (almost sub-triangular) blackish brown spot on the costa, barely united to the broad band, and extending downwards and outwards to just below the proximal end of the fork of the third vein, thus leaving the absolute

wing-tip narrowly clear. The second longitudinal vein forms nearly a sharp angle at the commencement of the downward loop, somewhat as in *Lepidanthrax*.

*Described* from a ♂ (type) in the Pusa collection, taken, 24-iii-06, at Larksom (Bengal), and from a ♀ in the Indian Museum collection from Margherita (Assam).

*N.B.*—I retain this species under *Argyramæba*, mainly because the pencil of hairs at the tip of the antennal style is regarded by Osten Sacken as the most important generic character, and, though small, these hairs are present in the new species. The bisection of the style is, however, not apparent, nor does the fork of the third vein show the usual appendix. The very flattened, irregularly oval, third antennal joint, the long, rather narrow abdomen, and the long wings approximate it to *Argyramæba* rather than to *Anthrax*. In one or two respects it resembles *Astrophanes*, O.S., a genus containing but one species (from Mexico); these are the "almost rudimentary development of the base of the costa and the closed anal cell." These two characters, in conjunction with the contiguity of the eyes on the vertex in the ♂, are regarded as the main generic distinction of the genus. As, however, I believe both sexes to be before me, my species cannot be an *Astrophanes*. The angled loop of the second vein approximates it to *Lepidanthrax*, O.S., so that for the present it should be regarded as somewhat of an aberrant species. It seems to bear some resemblance to Bigot's *Argyramæba appendiculata*, and it is just possible it may be identical with it, but the ♀ in the Indian Museum collection is labelled as a distinct species by Bigot (erroneously as a ♂), and I therefore treat it as such. When the two sexes are placed side by side the difference of width in the frons is sufficiently noticeable.

***Argyramæba ceylonica*, mihi, sp. nov.**

(Plate xii, fig. 24, abdomen.)

♂. Ceylon, Bengal. Long. 9 mm.

*Head*.—Frons and face quite black, with thick short black hair; antennæ black, third joint short, onion-shaped, with moderate style, basal joints with black bristles. Proboscis and palpi withdrawn, apparently blackish brown. Back of head narrow, blackish grey, almost bare.

*Thorax*.—Black, with short yellow hairs which are thickest on the shoulders and round the sides. Sides of thorax ash-greyish, with scattered yellow hairs. Scutellum black, with sparse yellow hair.

*Abdomen*.—Ovate, black, first segment with a conspicuous fan-shaped bunch of bright yellow hairs at the sides. Remaining segments towards the sides wholly tawny, this colour continuing at the actual sides of the segments up to the tip of the abdomen, which is blackish above. Belly tawny yellow with yellow hair.

Dorsum nearly bare, some microscopic black hairs on the black part. Genitalia rounded, inconspicuous, rather large, tawny, mainly withdrawn within the body.

*Legs*.—Uniformly tawny yellow, with minute bristles and hairs; coxæ ash-grey, with whitish hairs; tarsi dark brown.

*Wings*.—Grey, costal cell yellowish, mediastinal cell blackish for its whole length. Second longitudinal vein with rather a deep loop towards its tip: fork of the third vein with a distinct appendix, the vein parallel to the second. A small greyish black mark in the upper corner of the lower basal cell, and a similar one on the strong vein just above it. Halteres yellowish, knobs yellowish white, with a black mark above.

*Described* from three specimens taken by Mr. Green at Kandy, Ceylon, in October and November 1907, all in fairly good condition; also from three in the Pusa collection taken from 3-vii-07 to 24-viii-07 at Pusa. Type in my collection. It bears some resemblance to Doleschall's "*Anthrax*" *angustata* from Amboina, but is twice the size of that species, which, by the way, does not seem to have been seen since its author first met with it.

### ***Argyramœba niveisquamis*, mihi, sp. nov.**

♀. Baluchistan. Long. 7–8 mm.

*Head*.—Frons widening gradually from one-fifth the width of the head on the moderately wide vertex (where the ocelli are very close together on a very reduced tubercle), to fully one-third the width at the level of the antennæ. Frons and face densely covered with long drooping snow-white scales; a few longer, thin black hairs intermixed, also (more numerous) white bristles, which are longer than the scales. Oral orifice oblong, white; proboscis (in one specimen, the other is headless) wholly withdrawn. Antennæ black, second joint very short, third blackish grey, onion-shaped, tip drawn out into a blunt definite style. (There is no trace of the usual pencil of hairs, but the antennæ, of which only one remains, may be incomplete.) Back of head and under side dark grey, thickly coloured with snow-white scales.

*Thorax*.—Black, almost wholly covered with snow-white bristly hair, which is longest in front, below; in front of the wings and below them. This hair becomes scaly in places and on the posterior border of the scutellum is a moderately thick band of white scales.

*Abdomen*.—Black, the segments covered thickly with short creamy white and snow-white scales. A fan-shaped bunch of snow-white, comparatively softer, long hair on the anterior corners. A few long scattered black bristles on the dorsum, and, rather more numerous, along the sides of the abdomen. Belly with scaly and bristly hairs mixed, tip of abdomen with a few rather long brownish yellow bristly hairs with some longer fine black hairs below.

*Legs*.—Femora dark brown with closely set small snow-white scales; posterior femora with black isolated strong bristles; tibiæ

pale brown, with silvery snow-white scales, and more numerous short, black, spiny bristles; tarsi brown, with scattered small white scales, tips of each joint blackish, claws black.

*Wings*.—Clear, at the base of the costa a bunch of snow-white scales with some black bristles intermixed. A very small pale brown suffusion at the base of the third vein and on the discal cross-vein; mediastinal and marginal veins brown, also the narrow intervening space. A strong appendix at the base of the second vein and at the base of the fork of the third vein; discal cell rather long; second posterior cell two-and-a-half times as wide on wing-border as at base. Halteres pale brown, club much lighter. Tegulae whitish, nearly transparent, with a fringe of very short white hairs.

*Described* from two specimens in the Indian Museum collection from Baluchistan (one headless, otherwise in fair condition).

*N.B.*—I thought this might be *nivea* of Ross or perhaps Griffini's var. *lioyi*, but no mention is made by them of the *scales* with which it is covered, moreover the other differences are sufficient to warrant regarding my species as quite distinct.

### ***Anthrax clara*, Wlk.**

#### *Redescription.*

♂ (?). Long. 11 mm.

*Head*.—Frons widens rapidly from the narrow vertex, and is covered with black bristles, which are thick and long round base of antennae. Face widest just below antennae, rather less than one-third of the head, with thick yellow bristly hair and a row of black ones along upper part of mouth-border. Mouth and proboscis black. Antennae black, first joint with a linear row of strong black bristles on the outer and inner sides. Back of head blackish grey; below shining black, bare.

*Thorax*.—Black; dorsum with some rather thinly scattered, soft, black hair: entire anterior part, above and below, and the shoulders, with thick rich yellow hair. Under side cinereous, with sparse paler yellow hair. Scutellum (denuded) black, smooth, with traces of black or grey hair.

*Abdomen*.—Linear, tip rather blunted, as broad as thorax (Walker says "obconical"), black, with dorsum (? denuded) nearly bare. The sides with thick rich yellow hair, containing a tuft of black hairs on each side towards the tip. Belly black, with sparse yellow hair, which has a tendency to form transverse bands.

*Legs*.—Black. Femora with a little short yellow hair below middle pair, and on upper side of hind pair; tibiae with short black bristles, which, on the hind pair, are mixed with short linear black scales.

*Wings*.—Quite clear. Fore border narrowly dark brown, the colour only extends to the basal half of the marginal cell, or about as far as the origin of the second vein. Halteres pale brownish yellow, club lighter. Tegulæ brown, with a thick fringe of soft bright yellow hair.

*Described* from three ♂♂ (?) in the Indian Museum collection; one identified by Bigot, taken at Dehra Dun (foot of Mussoorie hills), the others from the Western Himalayas (Garhwal District, 6,000 ft.). These two are in perfect condition. The dorsum of the thorax, scutellum and abdomen may be denuded, but I am inclined to think the present condition is the natural one.

*N.B.*—Two other specimens are closely allied to the above species, one of which may be *A. lucida*, Wlk. It differs from *clara* as follows:—

The frons possesses short, pale yellow pubescence (which is quite absent in *clara*) below the longer black hairs; the face is wholly covered with pale yellow pubescence and there are *no* black bristles at all; the postocular orbit shows silvery pile at the sides; both the posterior part of the thoracic dorsum and the scutellum bear short, bright yellow pubescence; the abdomen has evidently been covered with sparse pale yellow hair forming at least narrow bands at the bases of the segments: the apical part of the abdomen bears, mainly at the sides, strong, brownish black scales, with a small bunch of *white scales* on each side of the fifth segment and a larger bunch of similar scales on the posterior corners of the last segment; the belly has more yellow hair than *clara*; the coxæ have each a bunch of yellow hair, the femora are nearly covered with yellow hair above, and the hind tibiæ are closely covered with distinct *brownish black scales*; the costal cell is *quite clear*, as is the entire wing except for the brown, very narrow mediastinal cell.

One example in the Indian Museum collection from Kawkareik (Amherst District), Tenasserim, captured by Dr. Annandale, 5-ii-08.

I assume its affinity to, and perhaps identity with, *clara*, in spite of Walker's brief description, also, on account of its having been placed next to that species by that author.

The second specimen is also in the Indian Museum collection, is in good condition, and was also taken by Dr. Annandale on 2-iii-08 on the Dawna Hills (2—3,000 ft.), Lower Burma.

This differs from *clara* as follows:—

The frons contains yellow pubescence as well as black hairs, the face has black hairs all over its surface instead of their being confined to a central row, and the abdomen is longer and more conical at the tip, the whole body being much narrower than in *clara*.

From the specimen I ally with *lucida* the present example differs mainly in the longer, narrower body, and also in the absence of the apical white abdominal spots, and as regards the scales on the hind tibiæ, which are clothed with simple, short, black bristly hairs. Long. 10 mm.

**Anthrax aperta**, Wlk.*Redescription.*

Long. 10 mm.

**Head.**—Frons black, narrowed on vertex, where the ocelli are placed on a small protuberance which does not touch the eyes; frons at widest part (at the base of the antennæ) nearly one-third of the head. Eyes black, with a tinge here and there of reddish bronze; facets small, uniform. The frons above the antennæ bears sparse black hairs, which become much thicker and more bristly about the base of each antenna, and on the face below the antennæ are stiff black hairs covering it. Just below the base of the antennæ, on each side of the raised centre edge of the face above the mouth is a *cluster of reddish yellow scales*, showing prominently amongst the thick black bristles. Antennæ black; first joint cylindrical, second sub-spherical, shorter than the first and of the same length as the third, which is conical and drawn out into a long apical style. The first two joints have short black bristles, the third is bare, with a little grey tomentum on upper side. Back of head black, nearly bare, under side of head black, with some short white hairs. Proboscis black.

**Thorax.**—Ground colour of dorsum black, a thick fringe of bright reddish tawny hairs along the anterior border, continued irregularly below, where is also a *thick collar of strong black bristles*.

The dorsum is covered with moderately short blackish brown hair, which is thinnest on the posterior half (partly denuded). On the shoulders a stripe of long whitish grey hair extends downward from the base of the wing, at which place some short grey and red hairs unite the stripe with the anterior border of reddish tawny hair. On each posterior callus is a bunch of long, thick white hair, which below becomes tawny yellow. Scutellum black, with soft (not numerous) black hairs and traces of grey hairs on posterior border.

**Abdomen.**—Broad as thorax, linear, with rounded tip. Black, with moderately short soft black hairs, generally distributed over the dorsum. On each anterior corner is a thick bunch of long white soft hairs, and these are apparently connected by a sparse basal band of white hairs. At about two-thirds the distance from the base is a transverse band of *short yellowish white scales*, terminating at each side of the abdomen in a bunch of silvery white long scales, below which are some yellowish ones. A small bunch of prominent silvery scales is placed on each side of the abdomen near the tip. The sides of the abdomen, posterior to the basal bunch of white hairs are clothed with black stiff bristles, with which some long brown scales are intermixed; and posterior to the transverse white band the sides are clothed with these brown scales only. Belly black with black hair and some transverse bands of yellowish grey hair.

*Legs*.—Black, femora with some soft long hairs; tibiæ with some apparently irregularly placed, short black bristles; tarsi, minutely pubescent. Hind tibiæ with a number of elongated brown scales intermixed with the black bristly spines, which are longest on this pair.

*Wings*.—Quite clear. Mediastinal and sub-costal veins with the intervening space dark brown, remaining veins black. The extreme base of the wing is blackish brown. On the wing-shoulder, in front of the costal basal cell, is an elongated patch of *erect short silvery white scales*, with a fan-shaped bunch of similar longer scales, contiguous, but placed on the adjoining part of the thorax. Halteres pale yellow.

*Described* from a specimen I believe to be a ♀ in the Indian Museum collection, in perfect condition except that the posterior part of the thorax, and the scutellum, show traces of being partly denuded.

*N.B.*—The specimen here described is probably Walker's *aperta*, it having been compared with the type (from this latter the head is missing) by Mr. Howlett, but the general description of the author does not apply so well as it might, as he does not mention the conspicuous collar of black bristles on the lower anterior border of the thorax, which (in a headless specimen) ought to have been plainly noticeable. Some minor differences are also to be noted. My redescription will enable the present species to be either confirmed or refuted as Walker's species.

### **Anthrax manifesta, Wlk.**

#### *Redescription.*

♀ (?). Long. 14 mm.

*Head*.—Frons narrowed considerably on vertex (as in *aperta*) on which is the small protuberance bearing the ocelli, not touching the eyes; frons at widest part (base of antennæ) equal to one-third the width of the head; black, clothed with short stiff black hair, which becomes longest and thickest round the base of the antennæ, and is continued along the middle line of the face below, whilst there are scattered black bristly hairs on the face below the antennæ, intermixed with the thick bright orange-yellow bristly hair which covers the face; some orange-yellow distinct scales being also present amidst the lower part of this hair. Antennæ black, first joint much broader at the tip, and on both the outer and inner sides a closely set row of strong long black spines; second joint bead-like, short, with a few bristles; third conical, bare, shining, elongated into a long style. Back of head black, with microscopic black pubescence.

*Thorax*.—Ground colour black. The anterior border, the shoulders and the sides, as far as the wings, clothed with dense, long, bright orange-yellow hair. A thick tuft of similar hair on the posterior calli, just behind the tegulæ, it being paler on the lower



part. Dorsum with soft short black hair which is replaced on the posterior border by yellowish grey, rather longer hair. Scutellum black, with soft blackish brown hair.

*Abdomen*.—Broad as thorax, linear, tip rounded. Black, the dorsum occupied with rather sparse black and brown hairs, with which, towards the base, are mixed some pale yellow hairs. The sides from the base to the tip are clothed with dense, soft, bright orange-yellow hair, which is interrupted just before the tip by a tuft of thick soft black hair on each side. The extreme tip of the abdomen bears only a few black hairs, and the yellow hairs on each side of these are much paler. Belly covered with paler yellow hairs.

*Legs*.—Black. Femora with a little soft black hair, tibiae with a few short black irregularly placed spines, posterior tibiae with a circlet of short spines at the tip. Hind tibiae with strong long black spines, intermixed with black and brown elongated scales which are rather numerous. All the femora have on the upper and hinder sides, and the anterior tibiae on the hinder sides, small scattered orange-yellow scales, lying close to the surface.

*Wings*.—Very pale grey. Extreme base (barely encroaching on basal and anal cells) dark brown, which colour extends deeply along the costa to the end of the sub-costal vein (first longitudinal), and in a slightly paler shade to the fourth longitudinal vein, and distally to just beyond the origin of the second vein, which is almost opposite the discal transverse vein, the marginal cell being similarly coloured for about its basal half. Halteres pale yellowish white. Tegulae brownish, with a fringe of long orange scales.

*Described* from three specimens taken by Mr. Howlett at Mussoorie (W. Himalayas).

*N.B.*—This species was compared by the above gentleman with Walker's type at the British Museum, and as that author's description agrees very well, I have accepted the identification and redescribed the species.

### ***Anthrax clausa*, mihi, sp. nov.**

♂. Lower Burma. Long.  $8\frac{1}{2}$  mm.

*Head*.—Slightly broader than thorax and abdomen. Frons and face black, clothed with dense short black hair. Eyes distinctly separated at vertex, the ocelli being placed well forward, the frons widening very rapidly, until at the insertion of the antennae it occupies half the width of the head. Antennae black; first joint cylindrical, second sub-spherical, much shorter than first; third onion-shaped, with long style, small, narrower and shorter than second. Under side of face uniformly black, proboscis almost invisible. Back of head dark grey with a few whitish hairs.

*Thorax*.—Ground colour dull black; anterior border with a rather thick fringe of grey hairs, which apparently cover both dorsum and sides.

*Abdomen*.—Linear with conical tip, of same width as thorax. Dull black (*denuded*), probably when in good condition the whole abdomen is covered with whitish grey hairs. The present specimen has bunches of such hair at the sides of the abdomen towards the base, also at the tip. The dorsum shows little traces of hair, and on it the hair is probably always sparser. At the sides of the abdomen towards the base are patches of all black hairs. Belly black, nearly bare.

*Legs*.—Blackish, the inner sides of the anterior tibiæ with a brown tint. Femora below with some soft moderately long blackish hairs; fore tibiæ with a single row of small black bristles, middle pair with a similar row on both outer and inner sides, and hind pair rather thickly clothed with them.

*Wings*.—Clear; *anal cell closed* immediately before the border; discal cross-vein placed just beyond one-third of the discal cell; first posterior cell widely open; fork of the third vein showing a tendency to form an appendix. Halteres cream-white: tegulæ small, dirty white, transparent, with fringe of short grey hairs.

*Described* from a unique ♂ in the Indian Museum collection from Moulmein (Lower Burma), taken by Dr. Annandale early in March, 1908.

*N.B.*—Although belonging to the genus *Anthrax*, which, in spite of my best efforts, I must leave still in an unsatisfactory state for the present, I do not hesitate to describe this species as new, on account of the difference in venation from the usual form. None of the species described from the East are recorded as having the anal cell closed.

### ***Bombylius fulvipes*, Bigot.**

♀. *Head*.—Frons at the level of the antennæ occupying one-third the width of the head, narrowing at vertex to one-fourth; clothed with short, golden yellow pubescence and some longer brownish yellow hairs. Under side of face with rather close, golden yellow hairs of moderate length; mouth-border bright lemon-yellow, with moderately long yellow hairs. Antennæ black: first joint rather long, sub-cylindrical, widening gradually to the tip, with some long yellow hairs on outer side; second joint sub-cylindrical, barely half as long as the first, with short black hairs; third joint twice as long as first, bare, partly flattened vertically, and "pinched" just before the middle, terminating in a very short, whitish blunt style. Ocelli on small prominence on the absolute vertex, equidistant. Eyes black, bare; facets small, uniform. Back of head covered with rather long bright yellow hair.

*Thorax*.—Covered with rather long yellowish grey hair, extending entirely over the sides and scutellum. Ground colour of both dorsum and scutellum black.

*Abdomen*.—Densely covered with pale yellowish grey hair, which becomes whitish on the tip. Ground colour blackish. Belly with close pale yellowish grey hair.

*Legs.*—Coxæ closely clothed with yellowish grey hair. Femora, tibiæ and base of tarsi pale tawny; extreme base of femora and apical half of tarsi black. Anterior femora with only a very little soft hair below, hind pair with a row of six or seven moderately strong black spines below. All the tibiæ irregularly beset with short black bristles which become spinose on the hind pair; and all the tibiæ have a circlet of very short black spines at the tip.

*Wings.*—Hyaline. Upper basal cell only a little, but distinctly longer than the lower one. Costal cell and base of wing as far as the origin of the basal cells tawny yellowish; the colour then, gaining an admixture of blackish, extends to three-fourths of the upper and the whole of the lower basal cell, leaving the whole discal cell quite clear; thence extending to the posterior margin of the wing, filling the basal halves of the anal and axillary cells, and the whole of the alulæ. The discal cross-vein is almost imperceptibly suffused. *The first posterior cell is closed just before the border.*

Described from a perfect single specimen in the Pusa collection, captured by Mr. F. M. Howlett at Allahabad, 19-x-05. As far as I am aware the ♀ has not previously been described, and though I cannot be absolutely sure of the identity, I think the present specimen can hardly fail to be Bigot's species.

***Bombylius terminalis*, mihi, sp. nov.**

♂. N.-W. India. Long. 5 mm.

*Head.*—Vertex of moderate size, dark grey. Eyes contiguous for two-thirds of the distance from the vertex to the antennæ; reddish brown. Antennæ wholly black; first joint longer than second, third nearly double the first and second together, bearing a short, minute bristle; first and second joints with pale hairs. Frons and face with yellowish hair, and snow-white pile around the antennæ, lower part of head white with white hair. Proboscis black, 3 mm. long. Back of head with short yellowish hair above and white hair below.

*Thorax.*—Thickly clothed with yellowish grey hair. Scutellum similar, the dark body colour being visible through the hair on both thorax and scutellum. Sides of thorax with similar hair, which becomes whitish on the under side.

*Abdomen* with thick yellowish grey hair, which is thinnest on the dorsum and thickest at the sides, becoming whitish towards the tip of the abdomen, the last two segments of which are covered with brilliant snow-white silvery pile and some whitish hairs. Belly with yellowish grey hairs, white towards tip.

*Legs.*—Pale yellow, the femora and tibiæ showing a slight whitish reflection in certain lights. Tips of all the tarsi black; the hind tarsi are mainly brownish, with black tips. A few soft hairs below the femora and a row of about six well-separated spines on under side of hind pair; tibiæ with minute spines, which are longest on hind pair.

*Wings*.—Clear, veins towards base yellowish. Discal transverse vein placed at one-third of the discal cell. First posterior cell closed half-way between border and origin of fork of fourth longitudinal vein. Halteres yellowish white.

*Described* from a unique ♂ in perfect condition in the Pusa collection, captured by Mr. F. W. Howlett at Allahabad, 3-iv-06.

*N.B.*—So far as his brief description goes, my species agrees fairly well with Bigot's *albosparsus*, but he distinctly says "legs and halteres black," which makes it appear as a different species.

***Bombylius vicinus*, mihi, sp. nov.**

♀. N.-W. India. Long. 4 mm.

This species is so closely allied to *terminalis* that I had almost decided to regard it as the ♀ of that species.

The differences, however, appear sufficient to be specific. The hair on the front is more whitish, that on the back of the head uniformly greyish yellow, very dense, the posterior orbit of the eyes is snow-white with minute white hairs. *First antennal joint pale yellow*, second somewhat lighter than in *terminalis*. *Base of proboscis yellow*. The hair on the thorax appears whiter, that on the sides and under side being quite white.

The scutellum, posterior portion of the thorax and the abdomen are covered with rather short brownish yellow hairs. Some white hairs at the base of the abdomen at the sides, and a few white hairs at the tip, but *no snow-white pile at the tip of the abdomen*.

Legs as in *terminalis*.

*Described* from a unique ♀ in the Pusa collection taken by Mr. Howlett at Allahabad, 3-iv-06.

*N.B.*—Possibly the ♀ of *terminalis*.

***Bombylius erectus*, mihi, sp. nov.**

(Plate xii, fig. 27, abdominal spines.)

♂ ♀. South India. Long. 8-12 mm.

*Head*.—Frons covered with short bright yellow hair, with two arched rows of stiff black bristles, one just above, the other just below, the antennæ and reaching from eye to eye. Sides of face with rather long, silky, cream-coloured hair. Lower part of face light grey, with long, snow-white hair. Mouth-border reddish. Antennæ black. Back of head with yellow hair. Eyes bare, distinctly excavated behind in the middle.

*Thorax*.—Cinereous black, with (in semi-denuded condition) traces of a thick yellow pile, an elongated bunch of strong black bristles at the side, in front of the wings. Sides of thorax with long, greyish white hair, yellowish hair immediately below the wings. Scutellum ferruginous, black at base, with a row of strong black bristles round the posterior edge, with yellow hair below it: dorsum with yellow hair.

*Abdomen*.—Ground colour apparently blackish brown, thickly clothed with yellowish and whitish hair, which is generally yellowish on the basal segments and apical one, and generally whitish on the others, but variable. Sides of third and fourth segments with thick tufts of white hair, and the sides of the fifth segment with a tuft of black hair; posterior borders of second and subsequent segments each with a row of closely placed, black, strong, erect spines, forming two arcs when viewed from behind (*vide* figure 27). Belly blackish, dorsum of segment with white pile, some black spines towards the tip.

*Legs*.—Blackish brown, with small spines and a silvery sheen seen in certain lights.

*Wings*.—Absolutely clear, extreme base slightly tawny, a small row of black bristles at base of costa. Tegulae pale yellow, with a narrow fringe of yellow hair. Halteres light brown.

*Described* from thirteen ♂♂ and twelve ♀♀ from Bangalore in fairly good condition except for the general absence of thoracic and abdominal pubescence: the abdominal spines have also been rubbed off most of the specimens.

Types in the Indian Museum collection. Co-types in the British Museum and my collection.

### *Dischistus resplendens*, mihi, sp. nov.

♂ ♀. India and Assam. Long. 5–6 mm.

*Head*.—Face below antennae rather prominent, black. Antennae black, very elongated; first very long, second very short, both with long black hair, third longest of all, flat, with parallel sides and a minute white style at tip. Proboscis strong, black, as long as head and thorax together. In the ♂ the eyes are contiguous from just below the vertex nearly to the antennae, facets very small, those above and towards the front being rather larger. The whole of the face is clothed with greyish, soft long hair, surrounded by a ring of stronger, long, bristly black hair placed round the inner orbit of the eyes. Vertex wholly occupied by the ocellar tubercle and a tuft of long black hairs; the three ocelli being placed in contact with the eyes. Under side of head with soft black and grey hairs. Back of head with a thick fringe of long soft yellowish grey hair, and a single row of black long hairs on the extreme ocular orbit.

In the ♀ the frons is one-third the width of the head, black, with sparse long black hairs and with a number of brilliant emerald-green and rose-pink small scales, intermixed and lying close to the surface. These are also very numerous on the back of the head, where the dense grey hair is replaced by a moderately thick fringe of pale yellow hairs. The face is shining black, bare, the mouth-border pale yellow, bare. Under side of head with greyish white soft hairs.

*Thorax* and scutellum denuded, but ground colour black, and dorsum surrounded in front, at the sides and behind with a dense

border of thick grey hair in the ♂, or a much sparser border in the ♀. The dorsum shows signs of having been covered lightly with yellowish grey hair. Attached to the surface of the dorsum of both thorax and scutellum are a number of brilliant bright green small scales, with a lesser number of rose-pink similar scales. Both coloured scales extend numerously over the sides of the thorax. In the ♂ is a quantity of black soft hair on the sides just below and in front of the wing-insertions.

*Abdomen*.—Similar to the thorax, with similarly coloured scales. In the ♂ the shoulders have a bunch of nearly white soft hair, with a fringe of yellow hairs between them. The sides with thick nearly white hair. In the ♀ the shoulders have yellow instead of white hair, and the coloured scales appear more numerous. In both sexes some long black hairs occur over the dorsum, and the belly is black with grey hairs and a few coloured scales.

*Legs*.—Black; tibiæ and metatarsi pale brownish yellow with short spines, hind pair darker, tarsi with black rather long bristles.

*Wings*.—Rather dark grey, brownish on anterior part. Venation normal<sup>1</sup>. Halteres blackish. Tegulæ brownish with yellowish grey fringe.

*Described* from one ♂ (type) from Dharampur (Simla hills, 5,000 ft., 6—8-v-07, and five ♀ ♀ from Nepal (Sukhwani, 15-ii-08), Naini Tal, 14—17-iv-07, and Assam (Mergue): all the specimens being in the Indian Museum. They are not more denuded of pubescence than is usual in this family, but that which remains is sufficient to show that perfect specimens would be of most resplendent beauty.

### *Geron argentifrons*, mihi, sp. nov.

♂ ♀. India. Long.  $2\frac{1}{2}$  mm.

*Head*.—Eyes contiguous, from the very reduced vertex to the antennæ; facets of moderate size, uniform. Ocelli well separated, semi-transparent, pale brown, placed on a slightly raised triangular tubercle. Antennæ normal, in ♂ black, in ♀ first two joints and base of third reddish. Frons from above, in ♂ with shining silvery white pile; in ♀ occupying one-fourth the width of the head, greyish white dusted, with a silvery appearance in certain lights, and some silvery white pile around base of antennæ.

*Thorax* (? denuded), ground colour deep, almost velvet-black, slightly greyish in front of the wings. Anterior part of thorax covered with pale greyish dust (which may possibly be present over the whole dorsum in perfect specimens). Scutellum apparently similar. Both thorax and scutellum with a few pale hairs. Sides of thorax greyish white, appearing silvery in certain lights.

*Abdomen* (? denuded) black, sides greyish; some light scattered hairs on dorsum, which is microscopically grey dusted. There are some silvery white bristly hairs towards the tip (♀). Belly black, grey dusted, with some grey hairs and silver pile towards tip.

*Legs*.—Coxæ rather pale brown, with some moderately long and thick greyish hair. Femora concolorous with scattered greyish hairs. Tibiæ pale yellowish brown, with short black spines and a circlet of them at the tip, which is slightly darker. Tarsi blackish, with some short black spines and microscopic black pubescence; base of metatarsi pale.

*Wing*.—Quite clear, iridescent; veins pale yellow; tegulæ pale yellow with short hairs. Halteres rather large and prominent, egg-shaped, pale lemon-yellow, nearly white.

*Described* from one ♂ (type of the species) in the Indian Museum, taken by Dr. Annandale at Lahore, 9-v-08; also one ♂ and several ♀ ♀ in the Pusa collection from Bombay and Pusa at which latter place it was bred (24-iv-05) from caterpillars found under the bark of the shisham tree (*Dalbergia sissoo*, Roxb.).

*N.B.*—This must be something like Macquart's *australis*, but in that species, according to the plate, there is a wide, well-defined grey border running round the front and sides of the thorax.

***Systropus nigricaudus*, mihi, sp. nov.**

(*Id. id.*, Bigot, *nom. nud.*)

♂ ♀. W. Himalayas (Mussoorie). Long. 16 mm.

*Head*.—Vertex reduced almost to a point. Eyes black, bare; contiguous for rather more than half the distance from the vertex to the antennæ, gradually diverging until at the mouth-border they occupy nearly one-third the width of the head: facets small, of uniform size, the frons and face combined appear as an isosceles triangle, the inner portion being very deeply retracted, leaving a broad white margin on the three sides. Above this the antennæ are placed on a slight yellowish white (almost quite white) prominence, and from the cavity below protrudes the long black proboscis,  $3\frac{1}{2}$  mm. long., which is brown at the base below. Antennæ: first joint white at the extreme base, becoming immediately pale yellow, graduating into orange, which forms the centre part, and deepening into black for about the apical third; the whole joint with scattered short black spines; second joint half the length of the first, wholly black, closely covered with black spines; third joint all black, quite bare, slightly shorter than the first. Back of head silvery white, with some short white hairs.

*Thorax*.—Dorsum black, finely punctate, with very sparsely scattered very short golden yellow hairs. Two rather narrow central grey stripes close together run from the anterior margin to the middle where they coalesce, and continue, united to the posterior margin. These stripes are only visible when viewed from behind. On the shoulders are placed three calli, the upper and largest one being almost bisected, the intermediate one very small and triangular, the lower one as large as the upper and also triangular. The upper one is contiguous to a more or less oblong spot on the dorsum, directed inwards and backwards; the remaining

calli are placed vertically beneath the upper one, all being contiguous to one another, the lower ones touching the concolorous fore coxæ. All these spots are pale yellowish white. A scale-like callus is placed in front of the wing, and is yellowish white on the anterior half, and black on the remainder, which reaches back to the posterior callus which is yellowish white. Below this callus is a small round yellowish white scale, by the *side* of the scutellum, and below the wing is an orange-yellow scale-like process, connected by a thin membrane to the just-mentioned scale. The sides of the thorax are black, with a little blackish brown hair and a little whitish grey hair in front of the insertion of the wings, and a larger quantity of longer similar hair on the large sternopleura.

Scutellum black, finely punctate, posterior half with some grey hairs.

*Abdomen*.—First joint at base wider than the scutellum, rapidly contracting posteriorly, forming a triangle; black, finely punctate on dorsum, with some very short grey hairs. At the sides are both black and grey much longer hairs. Second to fifth segments (inclusive) very narrow, dorsum black, sides and belly orange-yellow, fifth slightly widening at tip. Sixth, seventh and eighth segments widened into an elongated club, but the segments themselves are all shorter than the others, the eighth being shortest of all, sixth segment orange, seventh and eighth reddish brown. The whole abdomen at sides with very short, scattered, golden yellow hairs; on dorsum with microscopic black hairs, and the last three segments with very short black hairs which are also present on the posterior borders of these latter. The anal appendage ( $\sigma$ ), withdrawn within the ninth segment (which latter is peculiar to the  $\sigma$  only, in accordance with Osten Sacken's views in the Biol. Cen. Am., i, 157), consists of an orange process bearing an upper pair of jet-black conical "claspers," there being also an orange-coloured plate projected from the eighth segment, bearing a very small pair of black conical "claspers" at the tip.

*Legs*.—Coxæ: fore pair wholly pale yellowish white, bare; middle pair yellowish white, with a large black mark on the outer side, on the basal half, and bearing a few dark hairs; hind pair black, with a little pale colour on inner sides below. Femora: fore pair pale yellowish white, with a dark brown streak behind, about the middle; middle pair black, extreme base and tip pale yellowish white; hind pair, basal half pale yellow, deepening to orange on the apical half, extreme base black above. Tibiæ: fore pair pale yellowish white, bare; middle pair similar but with a few very small black spines at the tip; hind pair yellowish orange, streaked here and there with black above, with irregularly placed black spines, and with a circlet of some short black spines at the tip. Tarsi: anterior ones pale yellow, upper side blackish on apical half; hind pair black, minutely pubescent, slightly yellowish at extreme base, and with a row of minute black spines below.



*Wings*.—Light brownish grey, unmarked. Halteres lemon-yellow.

*Described* from one ♂ from Soondrijal (Nepal), which is the type specimen, also from a ♀ from Mussoorie. Both of these are in the Indian Museum, with Bigot's type specimen (from Sikkim), which is, however, in such bad condition that it is necessary to select another specimen as the type of the species, although it can be seen that Bigot's example is undoubtedly of this species. The species is also in the Pusa collection, taken by Mr. Howlett in September 1906, at Mussoorie.

*N.B.*—The two species by Vollenhoven, *blumei* and *tessellatus*, from Java and Sumatra, respectively, are not known to me, descriptions not being available; I therefore describe this species as new, the wide difference in locality rendering it highly probable that it is distinct.

LIST OF SPECIES OF BOMBYLIDÆ DESCRIBED FROM LOCALITIES  
ADJACENT TO THE ORIENTAL REGION.

**EXOPROSOPA, Macq.**

1. *lugubris*, Macq., 1840, Dip. Ex., ii, 1, 42  
(320), ♀, pl. xvii, 1 (wing) .. Arabia.
2. *olivierii*, Macq., 1840, l.c., ♀, pl. xvii, 4  
(wing) .. .. . *Id.*
3. *bagdadensis*, Macq., 1840, l.c., 43 (321),  
♀, pl. xvii, 5 (wing) .. .. . *Id.*

*N.B.*—The above three species are true *Exoprosopæ*, all with the first posterior cell closed.

4. *dedecor*, Lw., 1870, Schrift Ges. Freund.  
Nat., Moscow, 56 .. .. Turkestan.
5. *melæna*, Lw., 1874, Zeits. Ges. Natur-  
wiss., xliii, 416 .. .. North Persia.
6. *nubeculosa*, Lw., 1874, l.c., p. 56 .. Turkestan.

*N.B.*—These are in all probability true *Exoprosopæ*, as Loew would hardly have confounded the genus with any other.

7. *singularis*, Macq., 1840, Dip. Ex., ii, 1,  
41 (319), ♀, pl. xvii, 3 (wing) .. Arabia.

*N.B.*—A true *Exoprosopa* with the peculiarity of having the first posterior cell divided by a cross-vein placed just before the middle. This may be accidental but Macquart mentions its presence in the only four specimens examined.

8. *disrupta*, Wlk., 1871, Entomologist, v, 261 Arabia.
9. *paupera*, Wlk., 1871, *Id.*, 261 *Id.*
10. *antica*, Wlk., 1871, *Id.*, 261 *Id.*

**ARGYRAMÆBA**, Sch.

1. **etrusca**, F., 1794, Ent. Syst., iv, 257 . . . Persia.
2. **testacea**, Macq., 1840, Dip. Ex., ii, 1  
(*Anthrax*) (339), pl. xix, 4 . . . Arabia and  
Egypt.

*N.B.*—In the Palæarctic Catalogue this species is quoted as a possible synonym of *Anthrax incanus*, Klug (1832).

**ANTHRAX**, Scop.

1. **arabicus**, Macq., 1840, Dip. Ex., ii, 1, 63  
(341), ♀, pl. xxi, 7 (wing) . . . Arabia.
2. **percious**, Macq., 1840, l.c., 58 (336), ♂,  
pl. xxi, 2 (wing) . . . Persia.

*N.B.*—The wing figure shows an appendiculation bending towards and nearly touching the second longitudinal vein, whilst the fork of the third vein is very considerably looped.

3. **stenurus**, Lw., 1870, Schrift. Ges. Freund.  
Nat., Mosc. (1870), 56, and Besch.  
Eur. Dip., ii, 206 (1871) . . . Turkestan.
4. **subarcuatus**, Lw., 1870, loc. cit. (1), p. 56,  
et loc. cit. (2), p. 208 . . . *Id.*
5. **tenuis**, Wlk., 1871, Entomologist, v, 271 Arabia.
6. **erythrostomus**, Rond., 1873, Ann. Mus.  
Gen., iv, 299 . . . North Persia.

**COMPTOSIA**, Mcq.

1. **aurifrons**, Macq., 1851, Dip. Ex. Supp.,  
iv, 417, ♀, pl. x, 16 (wing) . . . Australia  
("Oriental side").
2. **bicolor**, Macq., 1851, loc. cit., 418, ♀, pl.  
x, 17 (head in profile) . . . *Id.*

**CALLOSTOMA**, Macq.

1. **desertorum**, Lw., 1873, Besch. Eur. Dip.,  
iii, 176 . . . Turkestan.
2. **soror**, Lw., 1873, *Id.*, 175 . . . *Id.*

**MULIO**, Latr.

1. **persicanus**, Beck., 1903, Zeits. Hym. u.  
Dipt., iii, 27 and 193 . . . Persia.

**CYLLENIA**, Latr.

1. **globiceps**, Lw., 1870, Schrift. Ges. Freund.  
Nat. Mosc. (1870), 57, and  
Besch. Eur. Dip., ii, 220  
(1871) .. .. Turkestan.

**AMICTUS**, Wied.

1. **insignis**, Lw., 1870, Schrift. Ges. Freund.  
Nat. Mosc. (1870), 57, and  
Besch. Eur. Dip., ii, 209 .. Turkestan.
2. **nobilis**, Lw., 1870, loc. cit. (1), p. 57, et  
loc. cit. (2), 211 .. Sarawschan-  
Thal (Central Asia).

**ANTONIA**, Lw.

1. **fedtschenkoi**, Lw., 1873, Besch. Eur.  
Dip., iii, 178 .. Turkestan.

**PLATYPYGUS**, Lw.

1. **maculiventris**, Lw., 1784, Zeits. Ges.  
Naturwiss., xliii, 416 .. North Persia.

**BOMBYLIUS**, L.

1. **sericans**, Macq., 1851, Dip. Ex. Supp.,  
iv, 420, ♀, pl. xi, 3 (head in  
profile) .. .. Australia  
("Oriental  
side").
2. **crassirostris**, *Id.*, loc. cit., 421, ♂ ♀, pl. xi,  
4, head in profile .. *Id.*
3. **albavitta**, *Id.*, loc. cit., 421, ♂, pl. xi,  
5 (full insect) .. *Id.*

*N.B.*—Very near *crassirostris* but has a long thin proboscis instead of a shorter thick one.

4. **pictipennis**, *Id.*, loc. cit., 422, ♀, pl. xi, 6  
(wing) .. .. *Id.*
5. **penicillatus**, *Id.*, loc. cit., 422, ♂, pl. xi,  
7 .. .. *Id.*
6. **candidus**, Lw., 1855, Neue Beitr., iii, 34 Persia.
7. **tephroleucus**, *Id.*, loc. cit., 28 .. *Id.*
8. **miscens**, Wlk., 1871, Entomologist, v, 271 Arabia.

9. **exiguus**, Wlk., 1871, Entomologist, v, 272 Arabia.  
 10. **pericaustus**, Lw., 1873, Bes. Eur. Dip.,  
     iii, 188 .. .. . Turkestan.  
 11. **megacephalus**, Ports., 1887, Hor. So. Ent.  
     Ross., xxi, 182 .. .. . Persia.

### ACREOTRICHUS, Macq.

1. **gibbicornis**, Macq., 1851, Dip. Ex. Supp.,  
     iv, 425 (sex ?), pl. x, 11 (full  
     insect) .. .. . Australia  
     ("Oriental  
     side").  
 2. **fusicornis**, *Id*, loc. cit., 426, ♀, pl. x, 12  
     (head in profile) .. .. . *Id*.

### CODIONUS, Rond.

1. **chlorizans**, Rond., 1873, Ann. Mus. Gen.,  
     iv, 299 .. .. . Persia.

### PLOAS, Latr.

1. **adunca**, Lw., 1870, Schrift. Ges. Freund.  
     Nat. Mosc. (1870), 57, and  
     Bes. Eur. Dip., ii, 212, ♂ ♀ Turkestan.

*N.B.*—In Loew's second description, only that of the ♀ applies to this species, the other sex being the ♂ of *bombyliiformis*, Lw.

2. **bombyliiformis**, Lw., 1873, Bes. Eur.  
     Dip., iii, 184; *adunca*, Lw.  
     (1871), loc. cit., ii, 212, ♂  
     only .. .. . Turkestan.

\* \* \* \* \*

### LIST OF BOMBYLIDÆ ORIGINALLY DESCRIBED FROM UNKNOWN LOCALITIES.

All the *Anthracinæ* herein given except the two species of *Argyramæba* by Bigot, were described under *Anthrax*, but I have, by a study of the affinities of the other species with which the following were grouped, endeavoured to refer them to their correct genera. The classification must therefore be accepted with some caution.

A. *Species probably belonging to* **HYPERALONIA**.

1. **pulchra**, Wlk., 1852, Ins. Saund., pt. 3, 169, ♀.
2. **rufescens**, Wlk., 1849, List. Dip. Br. Mus., ii, 238 (head wanting).
3. **imbuta**, *Id.*, *Id.*, 242.

N.B.—The sex is not given (allied to *A. fulvula*).

B. *Species probably belonging to* **EXOPROSOPA**.

4. **fumipennis**, Wied., 1828, Auss. Zwei., i, 267.

N.B.—The head of the type is wanting. In the Vienna Museum.

5. **meigenii**, Wied., loc. cit., 278.

N.B.—In the Vienna Museum and Wiedemann's collection.

6. **insularis**, Wlk., 1849, List Dip. Br. Mus., ii, 243, ♀ (head wanting).
7. **umbra**, *Id.*, *Id.*, 245, ♀.
8. **undans**, *Id.*, *Id.*, 246 (head wanting).
9. **vitreicosta**, *Id.*, *Id.*, 251 (head wanting).

N.B.—In his Ins. Saund. (p. 166) Walker queries this species of his as a synonym of *stupidia*, Rossi, but the Palæarctic Catalogue does not accept the identity.

10. **ignifera**, Wlk., 1852, Ins. Saund., pt. 3, 173, ♂.

C. *Species probably belonging to* **ARGYRAMÆBA** ; if not, then probably to **ANTHRAX** (*vera*).

11. **suffusa**, Wlk., 1849, List. Dip. Br. Mus., ii, 251, ♀.
12. **noctiluna**, *Id.*, *Id.*
13. **succedens**, Wlk., 1852, Ins. Saund., pt. 3, 192, ♀.

D. *Species belonging probably to* **ARGYRAMÆBA** or to **ANTHRAX**.

14. **leucotelus**, Wlk., 1852, Ins. Saund., pt. 3, 175, ♀.
15. **reducta**, *Id.*, *Id.*, 184, ♂.
16. **gnata**, *Id.*, *Id.*, 186, ♀.
17. **congrua**, *Id.*, *Id.*, 186, ♂.
18. **illata**, *Id.*, *Id.*, 191, ♀.
19. **relata**, *Id.*, *Id.*, 191, ♂.

E. *Species belonging probably to ANTHRAX* (sensu stricto).

20. **purpurata**, Wied., 1828, Auss. Zwei., i, 300 ("near A. *flava*, *cingulata*," etc.).

N.B.—Type in Vienna Museum.

21. **emilimpida**, Wied., 1828, Auss. Zwei., i, 310.

N.B.—In Vienna Museum.

22. **confluens**, Macq., 1840, Dip. Ex., ii, 1, 60 (338), ♂, pl. xix, 9 (wing).

Type in Paris Museum.

23. **notabilis**, *Id.*, *Id.*, 50 (348), ♂, pl. xix, 5 (wing).

Type in Paris Museum.

24. **brunnipennis**, *Id.*, *Id.*, 50 (348), ♀, pl. xx, 12 (wing).

Type in Paris Museum.

25. **luctuosa**, *Id.*, *Id.*, 50 (348), ♀, pl. xxi, 4 (wing).

Type in Paris Museum.

26. **subannulus**, Wlk., 1849, List. Dip. Br. Mus., ii, 261, ♂.

27. **Argyramœba aterrima**, Big., 1890, Ann. So. Ent. Fr., p. 349, ♂.

N.B.—This specific name was preoccupied by Doleschall in 1858.

28. **Argyramœba acroleuca**, Big., loc. cit., ♀.

China is queried as a locality.

29. **Mulio leucoprocta**, Wied., 1828, Auss. Zwei., i, 330.

Type in Vienna Museum.

N.B.—The Palæarctic Catalogue queries North Africa as a locality.

30. **Cyllenia aberrans**, Wlk., 1849, List. Dip. Br. Mus., ii, 297, ♂.

N.B.—The Palæarctic Catalogue quotes this as a possible synonym of *Mulio lugubris*, Lw. (Bes. Eur. Dip., iii, 164), from Transcaspia. If the two species are identical, Walker's name will have priority.

31. **Cyllenia afra**, Wied., 1828, Auss. Zwei., i, 358.

N.B.—The author suggested Africa as a possible habitat. He does not mention in what collection the type is to be found.

32. **Phthiria hypoleuca**, Wied., loc. cit., 355.

In Vienna Museum.

33. **Toxophora leucopyga**, Wied., loc. cit., 361.

In Vienna Museum.

34. **Systropus funereus**, Costa, 1865, Ann. Mus. Zool. Nap., ii, 152.

35. **Bombylius scutellaris**, Wied., 1828, Auss. Zwei., i, 343, ♀.

In Vienna Museum.

36. **B. dimidiatus**, Macq., 1840, Dip. Ex., ii, 1, 368, ♀, pl. vii, 5 (wing).

N.B.—There is a *dimidiatus*, Mg., a European species, which = *A. fimbriatus*, Mg.

37. **B. canus**, Macq., loc. cit., p. 372 (♀).

N.B.—Macquart says it may be the ♀ of his *B. latifrons* known from the Canary Islands and the Cape. Both species are now placed in *Systæchus*. Macquart also says *canus* is near *hypoleucus*, Wied., which was described from the Cape.

38. **B. limbipennis**, Macq., loc. cit., p. 374, ♀.

In Paris Museum.

39. **B. tripunctatus**, Macq., loc. cit., p. 379, pl. vii, 6 (wing).

N.B.—First posterior cell open. Type in Paris Museum.

40. **B. maculifer**, Wlk., 1852, Ins. Saund., pt. 3, 200.

41. **B. signifer**, Wlk., *Id.*, *Id.*, 200, ♂.

\* \* \* \* \*

In addition to the above species, there are a few which were originally described from unknown localities, but which have subsequently been located from some region with certainty. These are—

1. "**Anthrax**" **proserpina**, Wied., Auss. Zwei., i, 257. This is admitted as a North American species by Aldrich (1905) and relegated to *Hyperalonia*.

2. "**Anthrax**" **argyropyga**, Wied., Auss. Zwei., i, 313 (*argyropyga*, *lapsus*). Aldrich also admits this as a North American species, placing it in *Spogostylum*, with *Argyramæba contigua*, Lw., as a certain synonym, and *Argyramæba albosparsa*, Bigot, as a doubtful one. Aldrich adopts *Spogostylum* in place of *Argyramæba*, but the Palæarctic Catalogue adopts the latter, yet retains *Spogostylum* (emended to *Spongostylum*) for two species (*flavipes*, Roder, and *pallipes*, Lw.) from Asia Minor.

3. **Toxophora leucopyga**, Wied., Auss. Zwei., i, 361. This species also Aldrich includes in his North American Catalogue on

Macquart's record of it from Carolina, adding *fulva*, Gray, as a synonym on Osten Sacken's authority.

4. **Systropus sallei**, Costa (1865), Ann. Mus. Zool. Nap., ii, 151. Aldrich records this from Mexico.

5. **Systropus funereus**, Costa, loc. cit., p. 152. This species Aldrich thinks as synonymous with *S. fænoides*, Westw., this latter author recording it from Mexico.







# EXPLANATION OF PLATE XII.

- FIG. 1. *Atherix cincta*, Brun., ♀, wing.  
 „ 2. „ *calopa*, Brun., ♂, abdomen.  
 „ 3. „ *lanopyga*, Brun., ♀, full insect.  
 „ 4. „ *limbata*, Os. Sac., ♀, wing.  
 „ 5. „ *metatarsalis*, Brun., ♂, wing.  
 „ 6. „ *id.*, hind leg.  
 „ 7. *Leptis apicipennis*, Brun., ♀, wing.  
 „ 8. *Macellopalpus fulvidus*, Brun., ♀, head in profile  
 „ 9. *Chrysopilus albopictus*, Brun., ♀, wing.  
 „ 10. „ *marmoratus*, Brun., ♂, wing.  
 „ 11. „ *segmentatus*, Brun., ♂, abdomen.  
 „ 12. „ *id.*, wing.  
 „ 13. „ *unicolor*, Brun., ♂, wing.  
 „ 14. „ *stigma*, Brun., ♂, wing.  
 „ 15. *Hyperalonia suffusipennis*, Brun., ♀, wing.  
 „ 16. *Exoprosopa collaris*, Wied., ♀, wing.  
 „ 17. „ *lateralis*, Brun., ♀, wing.  
 „ 18. „ *bengalensis*, Macq., ♀, wing.  
 „ 19. „ *retrorsa*, Brun., ♀, wing.  
 „ 20. „ *annandalei*, Brun., ♀, wing.  
 „ 21. „ *insulata*, Wlk., ♀, wing.  
 „ 22. „ *brahma*, Sch., wing.  
 „ 23. *Argyramæba bipunctata*, Fab., wing.  
 „ 24. „ *ceylonica*, Brun., ♂, abdomen.  
 „ 25. „ *gentilis*, Brun., ♂ ♀, wing.  
 „ 26. *Anthrax*, sp. (Poona), ? ♀, wing.  
 „ 27. *Bombylius erectus*, Brun., ♂ ♀, abdominal spines.  
 „ 28. *Toxophora javana*, Wied., insect in profile.

